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NATIONAL DAM SAFETY PROGRAM. PEDDIE LAKE DAM (NJ 00140), RAHWAY--ETC(U)
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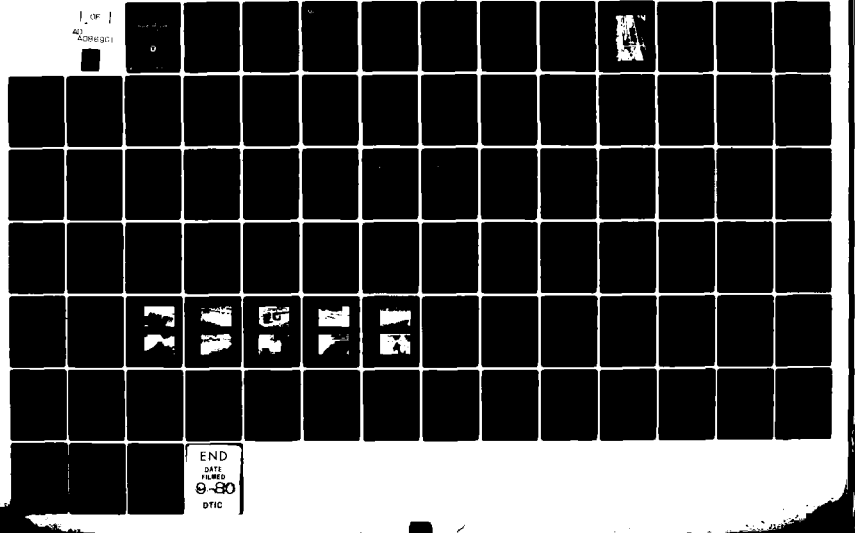

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RAHWAY RIVER BASIN
ROCKY BROOK, MERCER COUNTY
NEW JERSEY

LEVEL II

PEDDIE LAKE DAM
NJ 00149

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Approved for public release;
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DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

MARCH 1980

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Dam Safety
Structural analysis
Visual inspection
Embankments
National Dam Safety Program
Peddie Lake Dam, N.J.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

08 JUL 1980

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Peddie Lake Dam in Mercer County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Peddie Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 13 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

b. Within six months from the date of approval of this report, the following actions should be initiated:

(1) The owner should revise the current emergency warning procedure in order to establish a formalized written emergency action plan outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

(2) The earth abutments adjacent to the dam show signs of subsidence at the steps to the walkway. The owner should engage a professional consultant to conduct an investigation to determine the cause of the observed subsidence. Based on the findings of the investigation, the need for and type of remedial measures should be determined and then implemented.

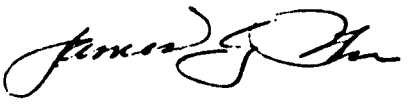
c. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Thompson of the Fourth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

PEDDIE LAKE DAM (NJ00149)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 12 November 1979 by Storch Engineers under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Peddie Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 13 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

b. Within six months from the date of approval of this report, the following actions should be initiated:

(1) The owner should revise the current emergency warning procedure in order to establish a formalized written emergency action plan outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

(2) The earth abutments adjacent to the dam show signs of subsidence at the steps to the walkway. The owner should engage a professional consultant to conduct an investigation to determine the cause of the observed subsidence. Based on the findings of the investigation, the need for and type of remedial measures should be determined and then implemented.

c. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

APPROVED: _____

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 6 JUN 80

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Peddie Lake Dam, NJ00149
State Located:	New Jersey
County Located:	Mercer
Drainage Basin:	Rahway River Basin
Stream:	Rocky Brook
Date of Inspection:	November 12, 1979

Assessment of General Condition of Dam

Based on visual inspection, past operation performance and Phase I engineering analyses, the dam is assessed as being in fair overall condition.

Hydraulic and hydrologic analyses indicate that the spillway is inadequate. Discharge capacity of the spillway is not sufficient to pass the designated spillway design flood (SDF) without an overtopping of the dam. (The SDF for Peddie Lake Dam is equal to one-half the probable maximum flood.) The spillway is capable of passing approximately 6 percent of the probable maximum flood or 12 percent of the SDF. Therefore, the owner should in the near future engage a professional engineer experienced in the design and construction of dams to perform more accurate hydraulic and hydrologic analyses. Based on the findings of the analyses, the need for and type of remedial measures should be determined and then implemented.

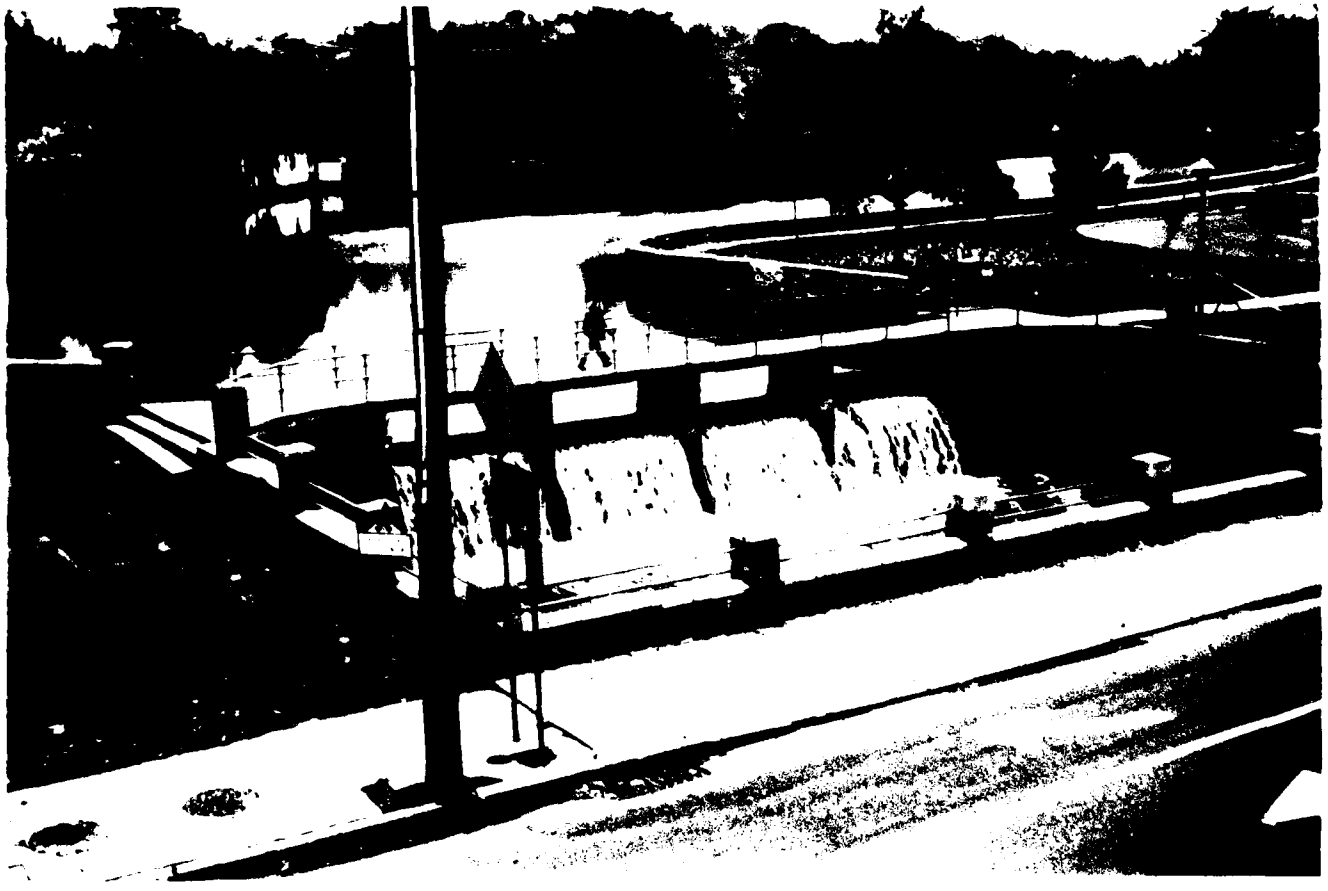
The owner should, in the near future, revise the current emergency warning procedure in order to establish a formalized, written emergency action plan outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

The earth abutments adjacent to the dam show signs of erosion or subsidence at the steps to the walkway across the dam. The owner should engage a professional engineer experienced in the design and construction of dams in the near future to conduct an investigation to determine the cause of the observed erosion. Based on the findings of the investigation, the need for and type of remedial measures should be determined and then implemented.

In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

Richard J. McDermott, P.E.

John E. Gribbin, P.E.



OVERVIEW - PEDDIE LAKE DAM

12 NOVEMBER 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314 The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrology and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PEDDIE LAKE DAM, I.D. NJ00149

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of Peddie Lake Dam was made on November 12, 1979. The purpose of the inspection was to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description of Dam and Appurtenances

Peddie Lake Dam consists of a concrete and stone masonry overflow spillway with a concrete walkway supported by stone masonry piers and abutments spanning its entire length. The walkway provides a connection between two portions of Memorial Park, owned by the Borough of Hightstown. The dam is of the Ambursen type and consists of concrete upstream and downstream faces and bottom, although the downstream face is stepped and finished with stone. The bottom is supported by piles, and timber tongue and groove sheeting runs along the upstream side. The dam is founded on earth and its ends abut earth as well.

Discharge from the spillway flows into a stilling basin formed by stone masonry training walls on the sides and a stone masonry road bridge downstream from the dam. The overall length of the dam is 72.0 feet and is oriented north/south. The height of the dam is 14.8 feet.

The elevation of the primary spillway crest is 81.0 National Geodetic Vertical Datum (N.G.V.D.) and that of the secondary crest is 81.3. The crest of dam is at elevation 84.8 and the stilling basin bottom elevation is 70.0.

A low level outlet works is located at the left, or south, end of the dam. It consists of a 2-foot by 2-foot sluice controlled by a lift gate at the upstream end. The lift gate is operated by a stem and control mechanism mounted on the top of dam.

b. Location

Peddie Lake Dam is located in the Borough of Hightstown, East Windsor Township, Mercer County, New Jersey. Constructed across Rocky Brook, the dam impounds Peddie Lake which is the focal point of a municipal park in the commercial center of Hightstown.

c. Size and Hazard Classification

Size and Hazard Classification criteria presented in "Recommended Guidelines for Safety Inspection of Dams," published by the U.S. Army Corps of Engineers are as follows:

SIZE CLASSIFICATION

	Impoundment	
	Storage (Ac-ft)	Height (Ft.)
Small	<1000 and ≥ 50	<40 and ≥ 25
Intermediate	≥ 1000 and $< 50,000$	≥ 40 and < 100
Large	$\geq 50,000$	≥ 100

HAZARD POTENTIAL CLASSIFICATION

Category	Loss of Life (Extent of Development)	Economic Loss (Extent of Development)
Low	None expected (no permanent structures for human habitation	Minimal (Undeveloped to to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures	Appreciable (Notable agriculture, industry or structures)
High	More than a small number	Excessive (Extensive community, industry or agriculture)

The following characteristics relating to size and downstream hazard for Peddie Lake Dam have been determined for this Phase I assessment:

Storage: 154 Acre-feet

Height: 14.8 feet

Potential Loss of Life:

A heavily travelled road is located 50 feet downstream from the dam. The downstream channel then passes through a heavily developed area of Hightstown. Failure of dam could cause loss of more than a few lives.

Potential Economic Loss:

As a result of dam failure, damage could be sustained by the bridges and buildings of the developed area located downstream from the dam.

Therefore, Peddie Lake Dam is classified as "Small" size and "High" hazard potential.

d. Ownership

According to NJDEP files, Peddie Lake Dam is located within a tract of land owned by the Borough of Hightstown, 148 North Main Street, Hightstown, New Jersey 08520.

e. Purpose of Dam

The purpose of the dam is the impoundment of a lake used for recreation.

f. Design and Construction History

Peddie Lake Dam was constructed in 1923 to replace a timber mill dam which was partly destroyed by fire. Construction plans by E. A. McMillan, C.E. are available in the NJDEP file. Construction began on July 30, 1923. After it was discovered that subsurface soil material was unsuitable for foundation, a pile foundation with a timber sheeting cutoff wall was determined to be necessary. Additional plans were then prepared to indicate design with a pile foundation.

The dam has remained essentially unchanged since its construction in 1923.

g. Normal Operational Procedures

The dam and appurtenances are operated and maintained by the Department of Public Works of Hightstown Borough. Regular maintenance consists of replacing fallen bricks and patching concrete surfaces of the dam. According to the Department of Public Works, the outlet works gate is opened in every major rainstorm to avoid the overtopping of the walkway and the flooding of Main Street. It is reportediy not known when the lake was last drawn down.

1.3 Pertinent Data

a. Drainage Area — 14.2 square miles

b. Discharge at Damsite

Maximum known flood at damsite	Unknown
Outlet works at pool elevation	60 c.f.s.
Spillway capacity at top of dam	860 c.f.s.

c. Elevation (N.G.V.D.)

Top of dam	84.8
Maximum pool-design surcharge	88.0
Recreation pool	81.5
Spillway crest	81.0
Stream bed at centerline of dam	70.0
Maximum tailwater	82 (estimated)

d. Reservoir

Length of maximum pool	3800 feet
Length of recreation pool	2800 feet

e. Storage (Acre-feet)

Recreation pool	63 Acre-feet
Design surcharge	319 Acre-feet
Top of dam	154 Acre-feet

f. Reservoir Surface

Top of dam	23.6 Acres
Maximum pool	29 Acres
Recreation pool	18 Acres

g. Dam

Type	Ambursen type concrete and stone masonry
Length	72.0 feet
Height	14.8 feet
Sideslopes - Upstream	1:1
- Downstream	4 steps from EL 81 to 70
Zoning	N.A.
Impervious core	N.A.

	Cutoff	Sheet piles on upstream side
	Grout curtain	N.A.
h.	Diversion and Regulating Tunnel	N.A.
i.	Spillway	
	Type	Uncontrolled concrete weir
	Length of weir - Primary	21 feet
	- Secondary	21 feet
	Crest elevation - Primary	81.0
	- Secondary	81.3
	Gates	N.A.
	Approach channel	N.A.
	Discharge channel	Stilling basin between dam and road bridge followed by earth channel downstream

j. Regulating Outlet

2' X 2' retangular sluice with lift gate at upstream end.

SECTION 2: ENGINEERING DATA

2.1 Design

Construction plans pertaining to the original construction of the dam are available in NJDEP file as follows:

Plans by E.A. McMillan, C.E., of Princeton, N.J., dated 1-27-1923 include:

1) Survey of Memorial Park Site
2) Dam & Retaining Walls
3) Stone Facing for Dam
4) Construction Details
5) Detail of Reinforced Concrete Floor on Piles

Hydraulic analyses for the spillway are also available. The spillway was designed to pass a flood of 675 c.f.s. with a head of 3.0 feet over the crest. The design flood was equivalent to 47.5 c.f.s. per square mile for a 14.2 square mile drainage area having characteristics as existing at the time of design.

2.2 Construction

Photographs taken during construction are available in NJDEP files.

2.3 Operation

Available information on operation of the dam is limited to two inspection reports. The first one in December of 1923 by McMillan indicated a leakage point on the south junction and another in October 1966 by the State of New Jersey indicated the settlement of backfill behind the addition to the wall along the north shore of the lake.

2.4 Evaluation

a. Availability

Available engineering information is limited to that which is on file at the NJDEP. The file contains correspondence, inspection reports, design report, hydraulic calculations and construction drawings.

b. Adequacy

Engineering data from the NJDEP file is adequate to permit a limited assessment of the hydraulic capacity of the spillway. However, the hydraulic analysis does not include lake stages high enough for a complete spillway assessment. No structural analyses are available in the NJDEP file.

c. Validity

The available hydraulic analyses appear to be valid with respect to engineering practice generally accepted in 1923. However, they are not valid according to analytic procedures developed by the Corps of Engineers for the present Phase I inspection and assessment program.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The inspection of Peddie Lake Dam took place on November 12, 1979, by members of the staff of Storch Engineers. A copy of the visual inspection check-list is contained in Appendix I. The following procedures were employed for the inspection:

1) The embankment of the dam, appurtenant structures and adjacent areas were examined.
2) The embankment and appurtenant structures were measured and key elevations determined by a surveyor's level.
3) The embankment and appurtenant structures and adjacent areas were photographed.
4) Depths of water were measured at various locations in the lake.

b. Dam

The concrete on the upstream side of the dam was submerged and could not be observed. Piers supporting the walkway appeared structurally stable although some surface deterioration was observed resulting in loosened stones. The downstream face of the dam is composed of a stepped stone masonry wall. Condition of the wall is generally satisfactory although there is some deterioration with loose stones and missing mortar. Evidence of subsidence of soil was noted at each end of the dam. According to the Public Works Department of Hightstown, this is due to overtopping in major storms. Concrete steps at each end were cracked and settled. Also, asphalt pavement adjacent to the right end of the dam was settled.

c. Appurtenant Structures

The outlet works operating mechanism at the south end of the dam is mounted on a concrete slab which is an extension of the walkway. Beneath the slab, the concrete wall on which the gate is mounted was spalled above the water line. The gate lift stem was rusted but appeared to be sound.

d. Reservoir Area

Peddie Lake has a maximum length of 2800 feet with widths varying from 350 feet to 150 feet. The shores are surrounded by a park and residential area. The slope of the shore line is generally moderately flat. A public road bridge crosses the lake about 1200 feet upstream from the dam. Several dwellings are located along both sides of the lake.

e. Downstream Channel

Discharge from Peddie Lake Dam spillway enters a stilling basin between the dam and a road bridge located 50 feet downstream. Beyond the bridge Rocky Brook flows through 4000 feet of urban area and under Route 130 before joining the Millstone River.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The water level in Peddie Lake is controlled naturally by overflow over the spillway of Peddie Lake Dam. In times of heavy rain, the outlet works gate is reportedly opened by Public Works employees to lower water level and augment the spillway capacity.

4.2 Maintenance of Dam

Maintenance of the dam is performed by the Public Works Department of Hightstown on an "as needed" basis. Reportedly, the masonry wall is patched on a yearly basis.

4.3 Maintenance of Operating Facilities

Maintenance of operating facilities is performed on an "as needed" basis.

4.4 Description of Warnign System

Reportedly, personnel of the Public Works maintenance crew monitor the water level in the lake during storms and report to their supervisors.

4.5 Evaluation of Operational Adequacy

Operation of the dam has not been completely successful even with the use of the flood gate. It is reported by the Department of Public Works that water has overtopped the walkway steps in the past.

Maintenance documentation is reportedly available from the Public Works Department of Hightstown. Maintenance of the dam appears to have been generally adequate.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

The intensity of storm water runoff that the spillway should be able to handle is based on the size and hazard classification of the dam. This runoff intensity, called the spillway design flood (SDF), is described in terms of frequency or probable maximum flood (PMF) depending on the dam's size and potential hazard classification. According to the "Recommended Guidelines for Safety Inspection of Dams," published by the U.S. Army Corps of Engineers, the SDF for Peddie Lake falls in a range of 1/2 PMF to PMF. In this case, the low end of the range 1/2 PMF is chosen since the factors used to select size and hazard classification are on the low side of their respective ranges.

Computations of the inflow hydrograph were performed by the HEC-1-DB computer program using the Snyder's Method with parameters given by Army Corps of Engineers. Detailed hydrologic computations and computer output are contained in Appendix 4. The calculated SDF peak inflow is 8499 c.f.s.

The spillway discharge rates were computed by the use of a weir formula appropriate for the configuration of its overflow section (See Appendix 4). The spillway discharge with lake level equal to the top of dam was computed to be 860 c.f.s.

The SDF was routed through the dam by the use of HEC-1-DB computer program using the modified Puls method. The routing resulted in an overtopping of the dam by a depth of

3.2 feet. A dam breach would not significantly increase the hazard potential for loss of life downstream due to dam failure from overtopping over that which exists without failure. Accordingly, the subject spillway is assessed as being inadequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

Reportedly, the dam has been overtopped at least once in the past. Water that overflows the walkway will flow over the steps at both the north and south ends of the dam and into the commercial district of Hightstown. Soil erosion at the ends of the dam results from the overtopping according to personnel of the Department of Public Works.

c. Visual Observations

Evidence of erosion was observed at the reported areas. However, it could not be determined whether the cause was overtopping or subsidence.

d. Overtopping Potential

As indicated in paragraph 5.1.a, a storm of magnitude equivalent to the SDF would cause overtopping of the dam by a height of 3.2 feet above the top of dam. The spillway is capable of passing approximately 12% of the SDF with lake level equal to the top of dam.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The dam appeared, at the time of inspection, to be outwardly structurally sound. However, minor cracks and signs of erosion were observed at the steps to the walkway bridge. There were no major indications of instability at the time of the inspection.

If leakage through the dam was occurring at the time of inspection, it could not be detected because of overflow and tailwater.

b. Generalized Soils Description

The generalized soils description of the dam site consists of recent alluvium, composed of stratified materials deposited by streams, overlying a discontinuous mantle of stratified, alluvial material deposited during the Quaternary period, known as the Pensauken Formation. The Quaternary deposits consist of roughly assorted, rather variable material composed of stratified sand and silt, with varying amounts of intermixed gravel. The underlying formations are unconsolidted Cretaceous sediments known as Merchantville Clay.

c. Design and Construction Data

From the NJDEP file, plans by E.A. Mcmillan, C.E. of Princeton, N.J. contains the following sheets:

1. Topographic Map Showing Site of Dam
2. Topographic Map Showing Drainage Area

3. Survey of Park Site
4. Ambursen Dam
5. Dam and Retaining Walls
6. Stone Facing for Dams
7. Construction Details

d. Operating Records

There are no operating records available for the dam. According to the Public Works Department of Hightstown, the water level is closely monitored in major storms and the outlet gate has been opened whenever necessary.

e. Post Construction Changes

No record of any post construction changes are available.

f. Seismic Stability

Peddie Lake Dam is located in Seismic Zone 1 as defined in "Recommended Guideline for Safety Inspections of Dams" which is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions if stable under static loading conditions. Peddie Lake Dam appeared to be outwardly stable under static loading conditions at the time of inspection.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4, the spillway of Peddie Lake Dam is assessed as being inadequate. The spillway is not able to pass the SDF without an overtopping of the walkway and the natural ground adjacent to the north and south ends of the dam.

The dam appeared at the time of inspection to be outwardly stable. The effect of the observed erosion or subsidence adjacent to the ends of the dam cannot be determined without further investigation.

b. Adequacy of Information

Information sources for this study include 1) field inspection, 2) USGS quadrangle sheet, 3) aerial photography from Mercer County, 4) construction drawings prepared by E.A. McMillan C.E., 5) consultation with maintenance and operation personnel from Hightstown, Department of Public Works and 6) correspondence, calculations and inspection reports in the NJDEP file.

The information obtained is sufficient to allow a Phase I assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

Some data not available are as follows:

1) Stream and lake gaging records.
2) Post construction records.
3) Structural design report.

c. Necessity for Additional Data/Evaluation

Although some data pertaining to Peddie Lake Dam is not available, additional data are not considered imperative for this Phase I evaluation.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a, the spillways are considered to be inadequate. It is therefore recommended that a professional engineer experienced in the design and construction of dams be engaged in the near future to perform more accurate hydraulic and hydrologic analyses. Based on the findings of the analysis, the need for and type of remedial measures should be determined and then implemented.

The owner should, in the near future, revise the current emergency warning procedure in order to establish a formalized written emergency action plan outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

The earth abutments adjacent to the dam show signs of erosion or subsidence at the steps to the walkway. The owner should engage a professional engineer experienced in the design and construction of dams in the near future to conduct an investigation to determine the cause of the observed erosion. Based on the findings of the investigation, the need for and type of remedial measures should be determined and then implemented.

b. Maintenance

In the near future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

PLATES

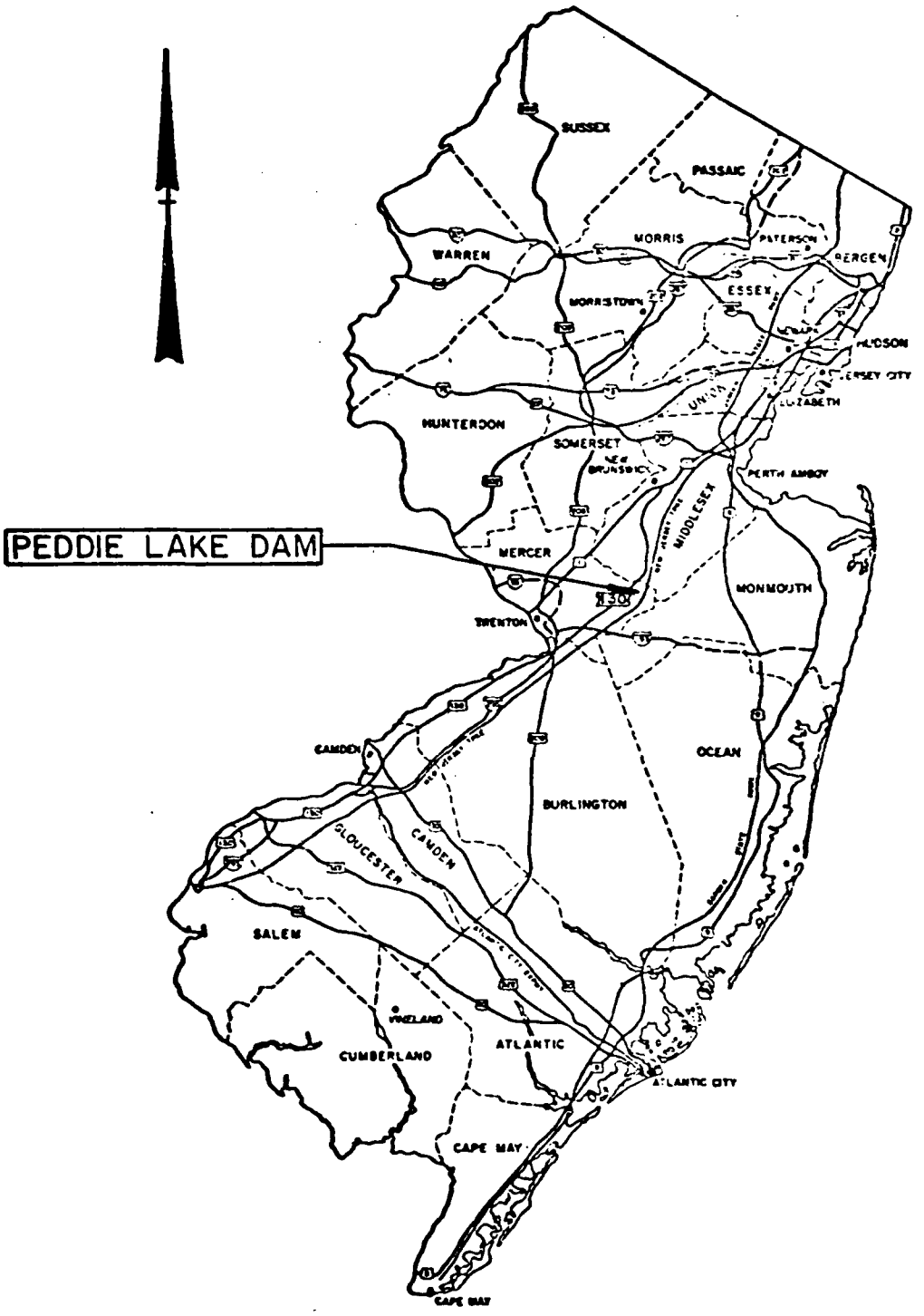


PLATE 1

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS KEY MAP PEDDIE LAKE DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	I.D. N.J.00149 — SCALE: NONE DATE: NOV., 1979

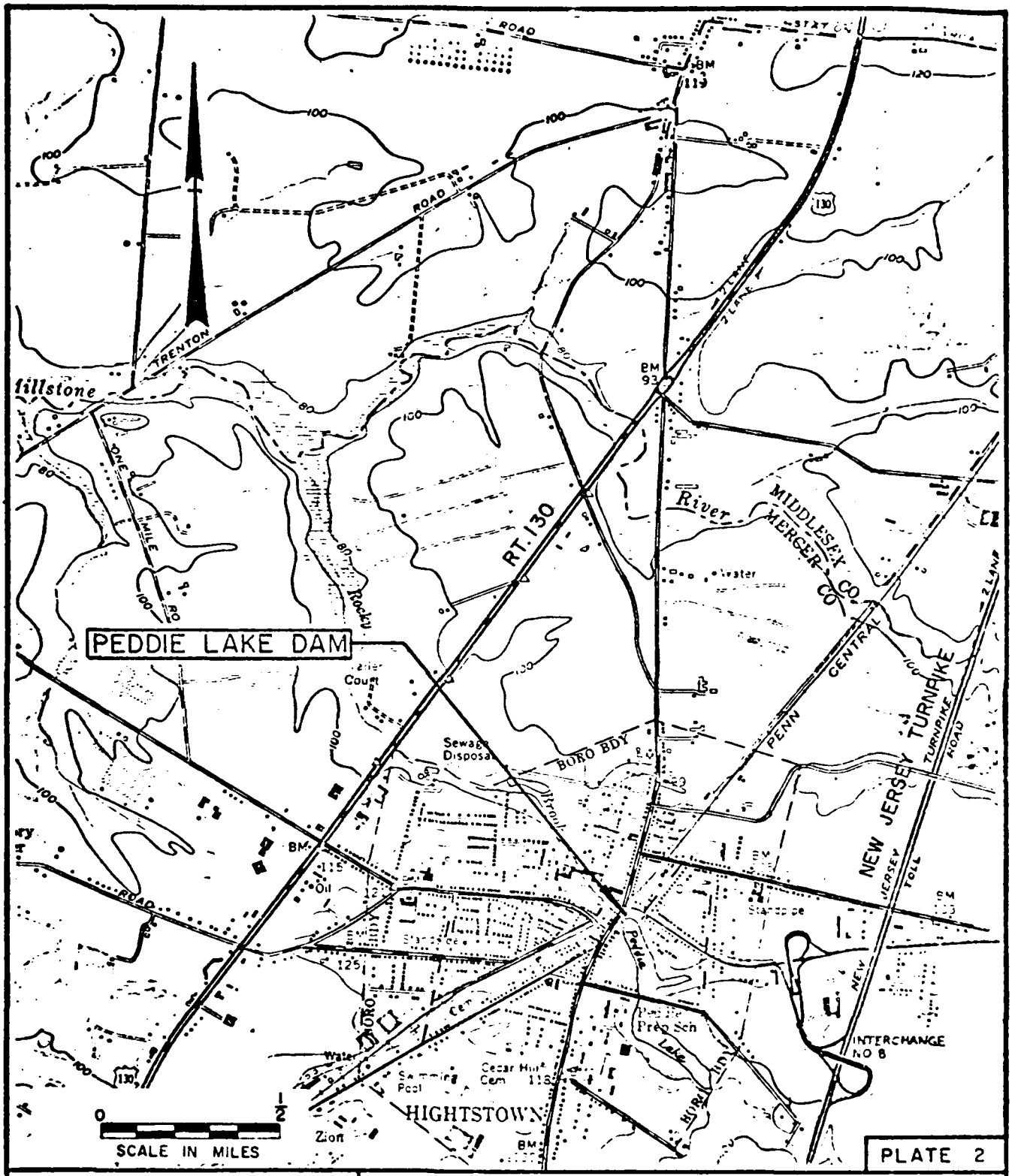


PLATE 2

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

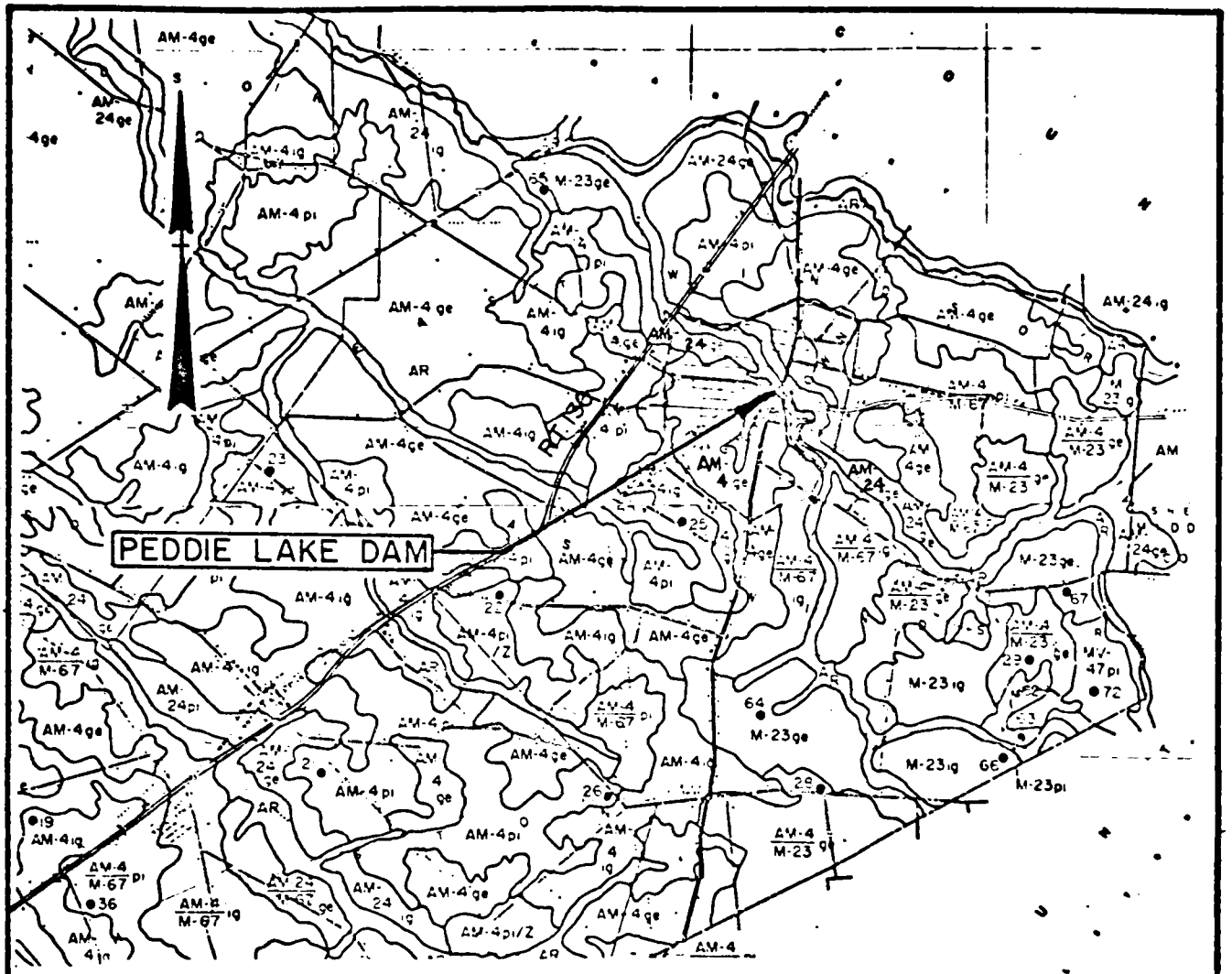
DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

VICINITY MAP

PEDDIE LAKE DAM

I.D. N.J. 00149	SCALE: AS SHOWN
	DATE: NOV., 1979



Legend

AR	Recent alluvium composed of stratified materials deposited by streams.
AM-24	Sand, silty sand and sandy silt deposited during the Quaternary period. (Pensauken Formation).
AM-4	Sandy silt, silt and clayey silt with some intermixed gravel deposited during the Quaternary period. (Pensauken Formation).

NOTE: Information taken from Rutgers University Soil Survey of New Jersey, Report No. 12, Mercer County and Geologic Map of New Jersey prepared by Lewis and Kummel.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

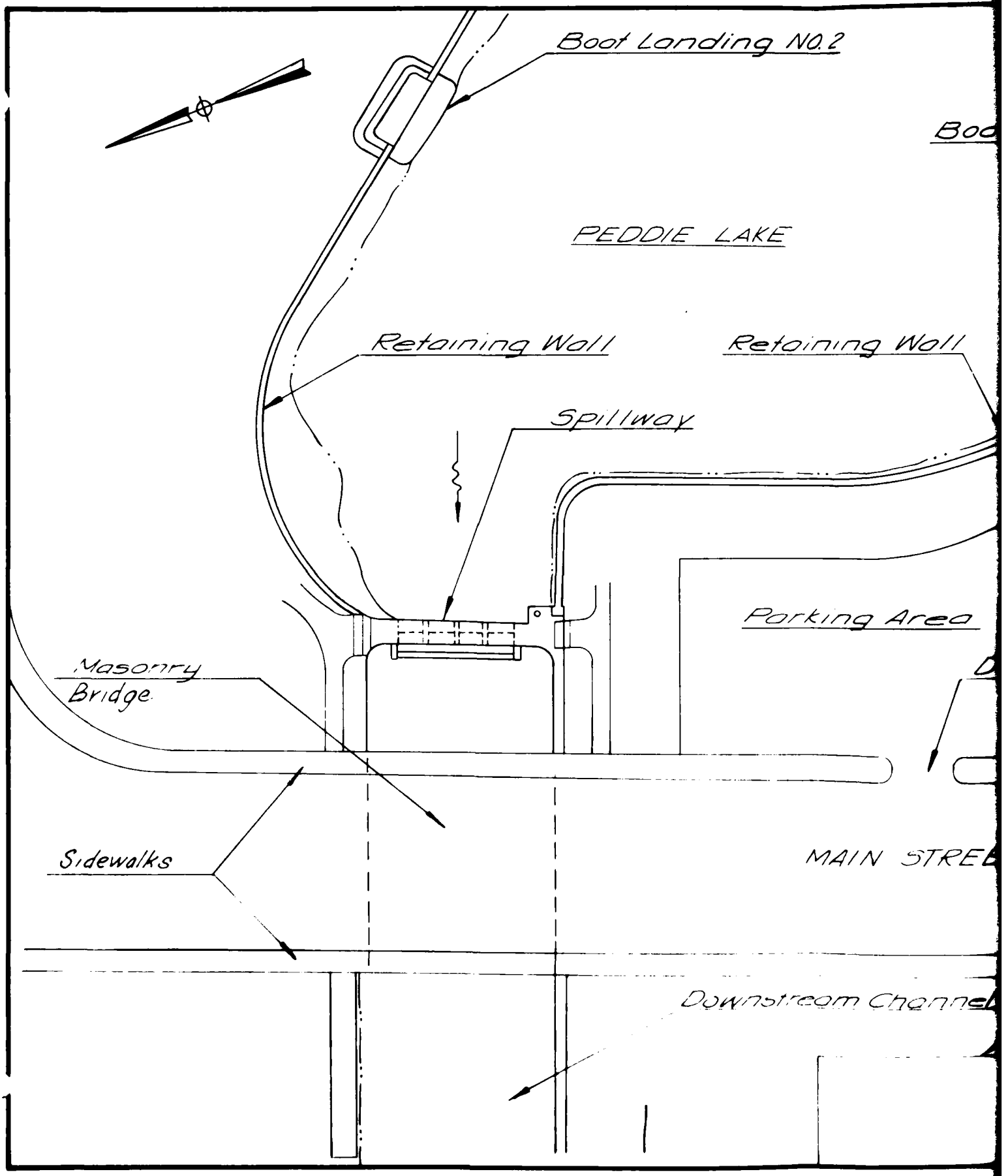
DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

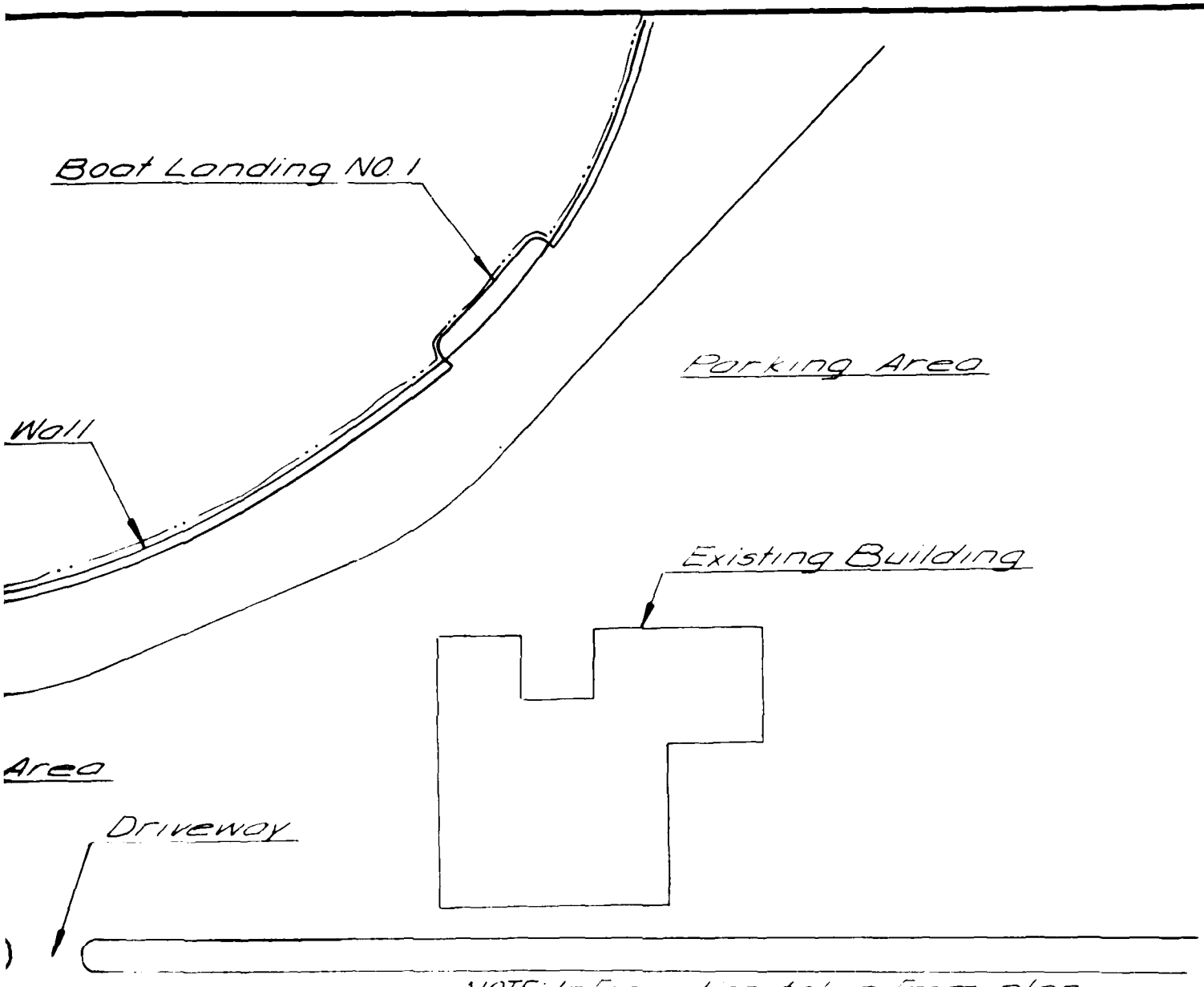
INSPECTION AND EVALUATION OF DAMS

SOIL MAP

PEDDIE LAKE DAM

I.D. NJ 00149	SCALE: NONE
	DATE: NOV., 1979


Boot Landing NO.2
PEDDIE LAKE
Retaining Wall
Retaining Wall
Spillway
Parking Area
Masonry Bridge
Sidewalks
MAIN STREE
Downstream Channe



NOTE: Information taken from plan "Construction Details for Memorial Park Hightstown, NJ by E A McMillon and field inspection November 12, 1979

STREET (Paved Road)

Channel

Existing Building

2

PLATE 4

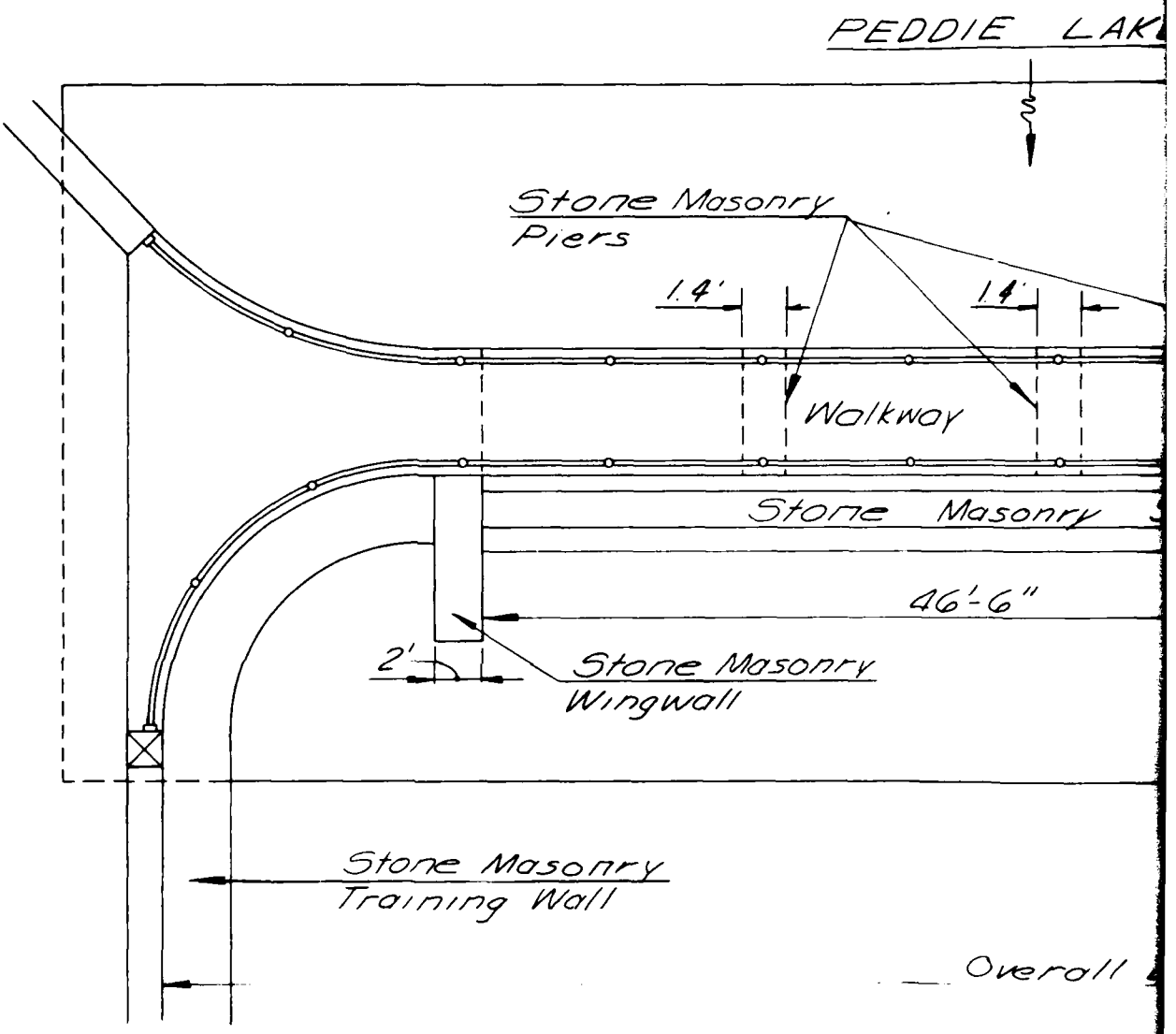
STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

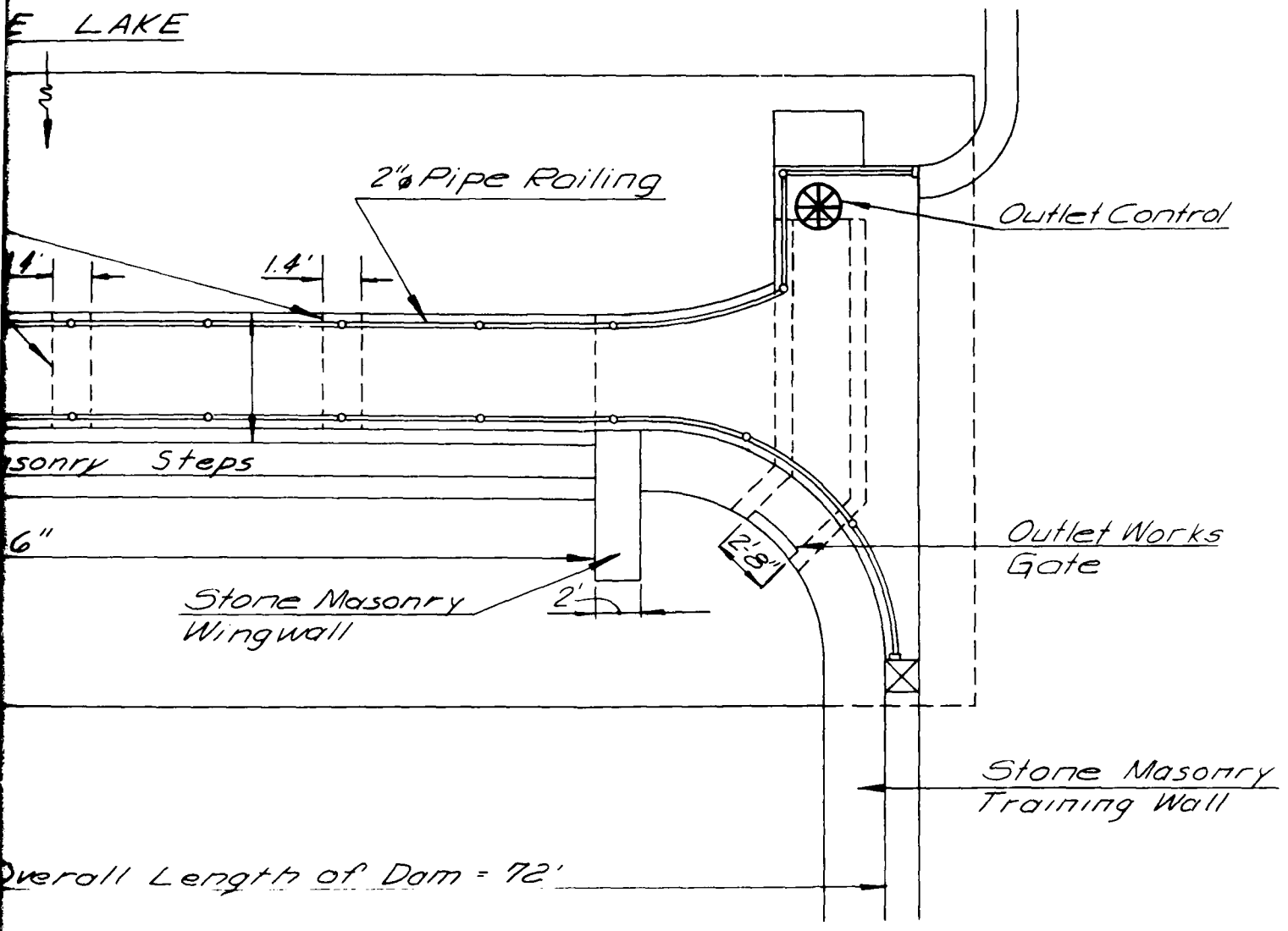
GENERAL PLAN

PEDDIE LAKE DAM

I.D. N J 00149	SCALE NOT TO SCALE
	DATE JAN 1980



NOTE:
Information taken from plan "Construction Details for Memorial Park Hightstown, NJ" by E A McMillon and inspection.



2

PLATE 5

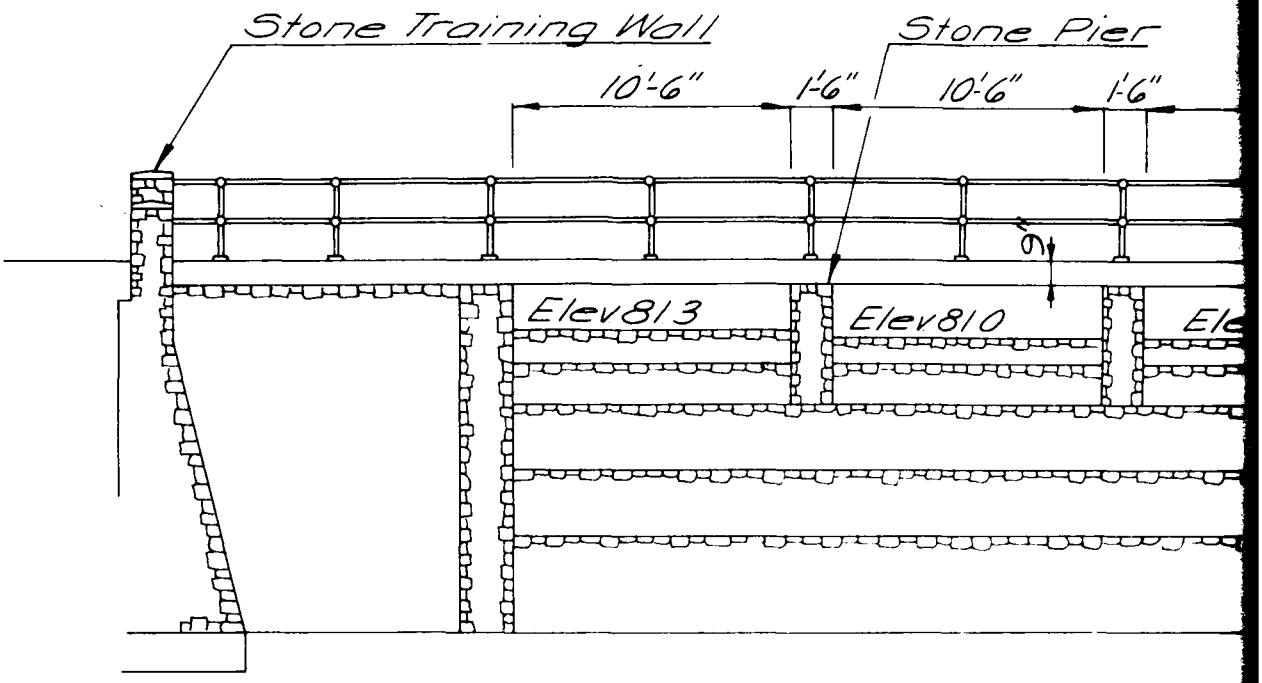
STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

SPILLWAY PLAN

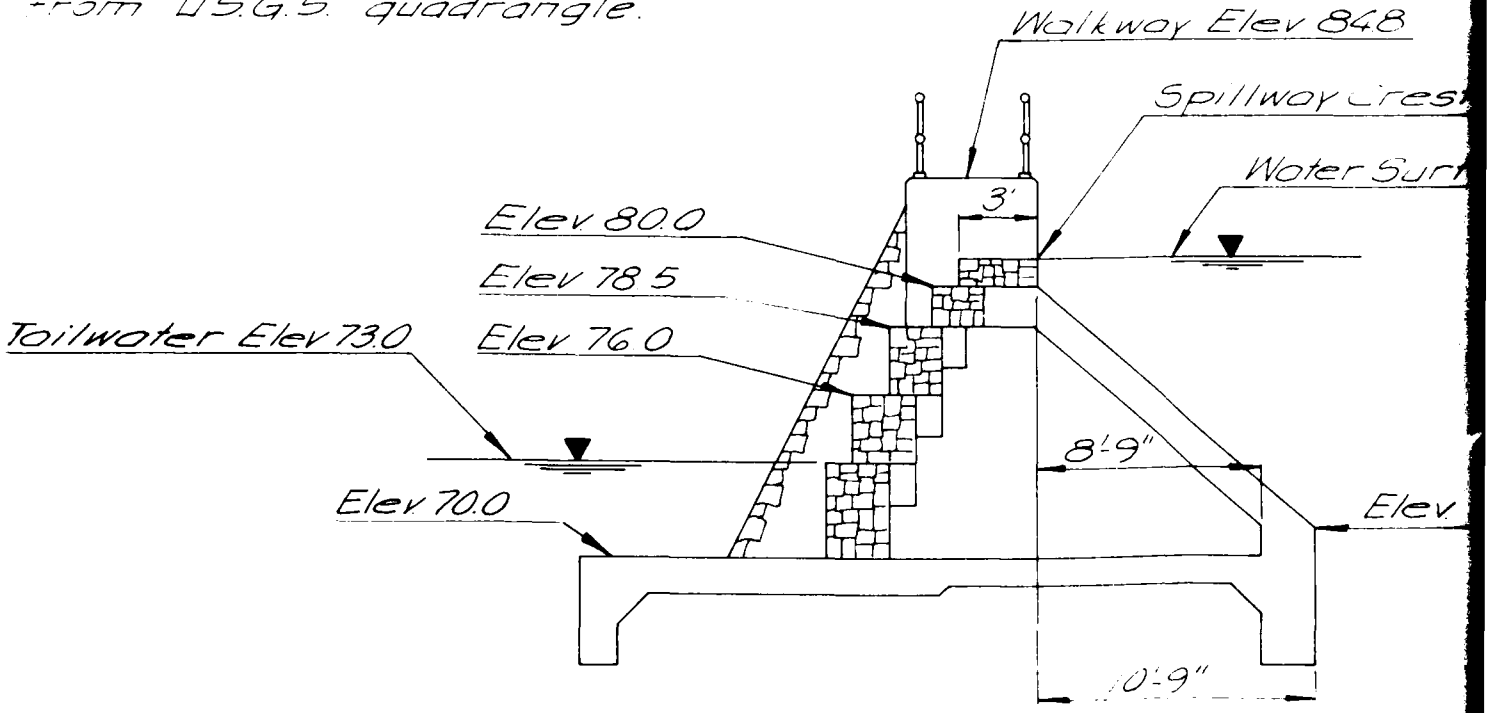
PEDDIE LAKE DAM

I.D N.J. 00149	SCALE NOT TO SCALE
	DATE

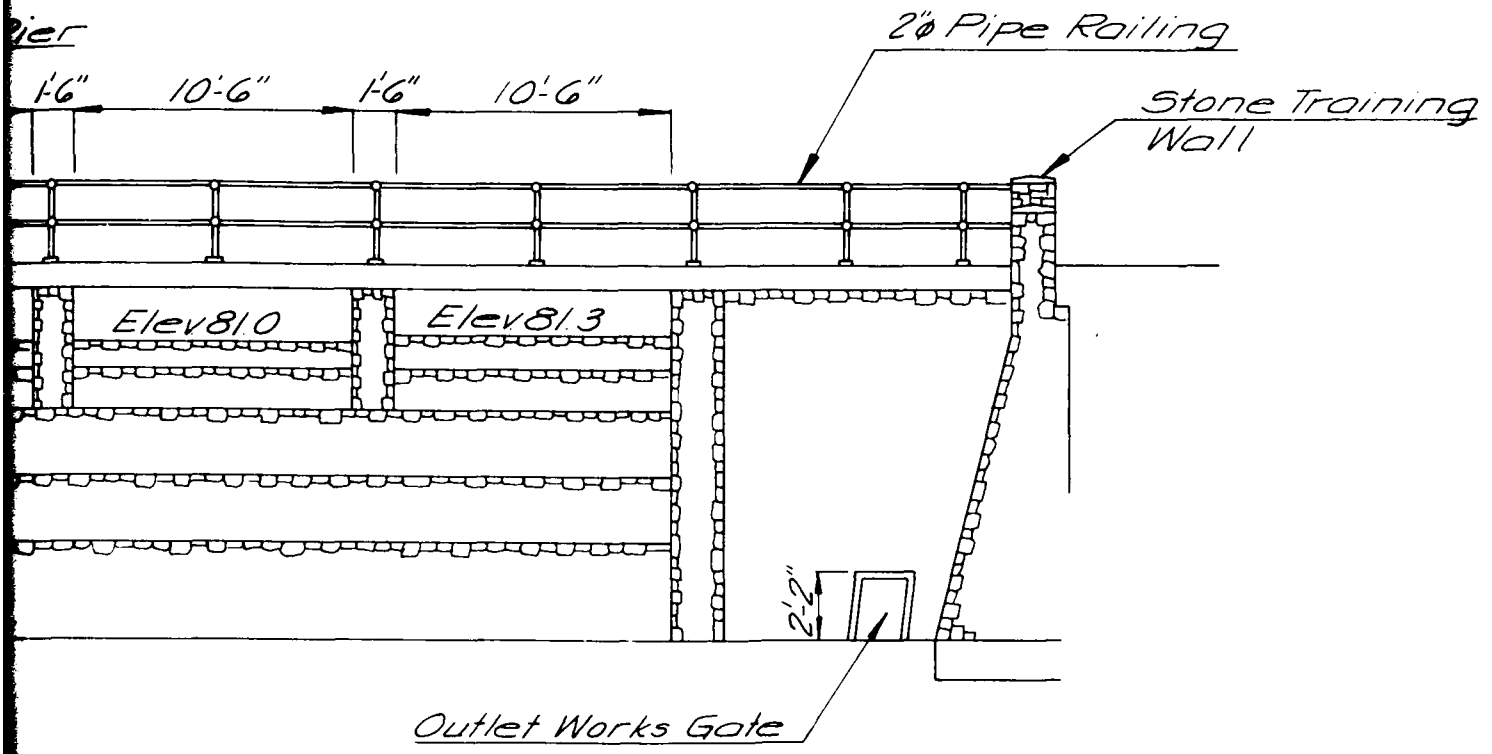


NOTES:
1. Information take from plan "Construction Details for Memorial Park Hightstown, N.J." by E.A. McMillon and field inspection November 12, 1979.
2. Elevations based on N.G.V.D. estimated from U.S.G.S. quadrangle.

ELEVATION



SECTION



TION

848

y Crest Elev 810

er Surface Elev 815

Elev 710

2

PLATE 6

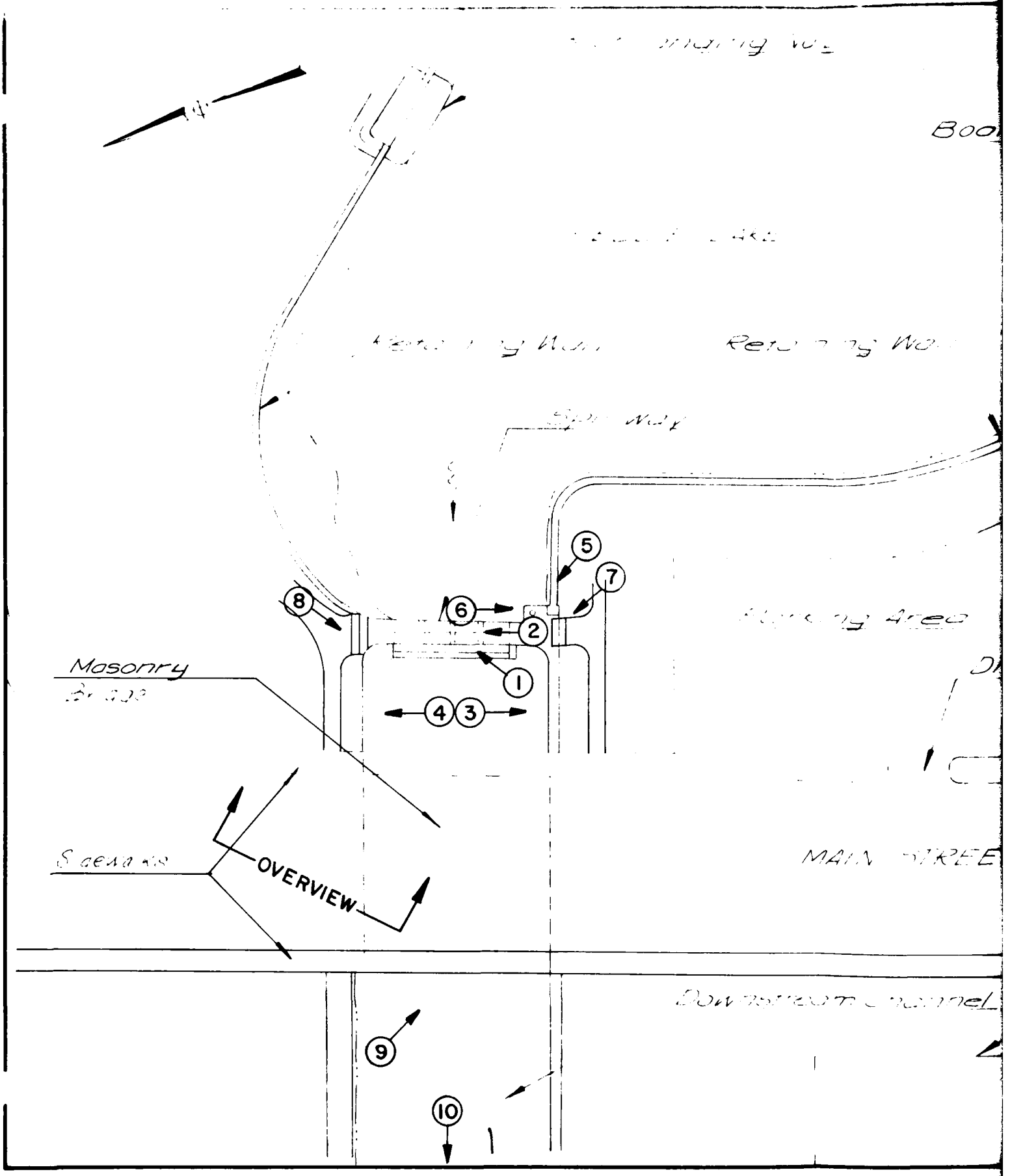
STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

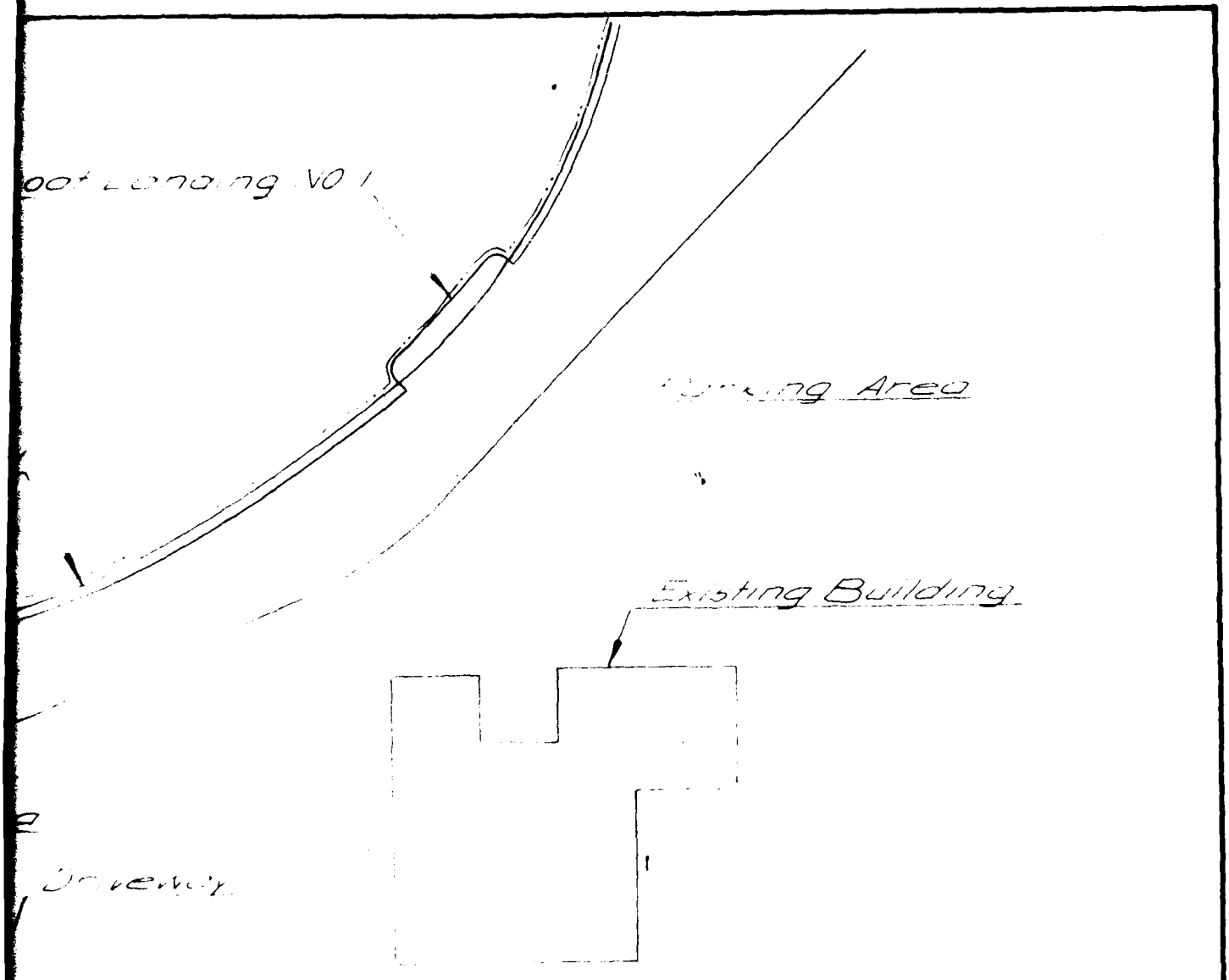
INSPECTION AND EVALUATION OF DAMS

SPILLWAY ELEVATION & SECTION

PEDDIE LAKE DAM

I.D. N.J. 00149	SCALE: NOT TO SCALE
	DATE:


Masonry
OVERVIEW
MAIN STREET
1
2
3
4
5
6
7
8
9
10



NOTE: Information taken from plan "Construction Details for Memorial Park Hightstown, NJ by E A McMillan and field inspection November 2 1979

PLATE 7

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

PHOTO LOCATION PLAN

PEDDIE LAKE DAM

ID NJ 00149	SCALE NOT TO SCALE
	DATE JAN 1980

APPENDIX 1

Check List - Visual Inspection
Check List - Engineering Data

Check List
Visual Inspection
Phase I

Name of Dam Peadie Lake Dam County Mercer State New Jersey Coordinators NJDEP

Date(s) Inspection 11/12/79 Weather P - Cloudy Temperature 45°F

Pool Elevation at Time of Inspection 81.5 M.S.L. Tailwater at Time of Inspection 73.0 M.S.L.

Inspection Personnel:

John Gribbin Alan Volle

Ronald Lai Thomas Miller

Richard McDermott

John Gribbin Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Dam is composed of stone masonry.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Evidence of subsidence of soil at each end of dam. Concrete steps at each end cracked and settled. Asphalt pavement at right end of dam settled.	Recommend investigation to determine extent of subsoil erosion.
DRAINS	Weep holes observed in stone masonry training walls downstream from dam. No discharge or evidence of material transport noted. Drain outlet in left training wall appeared to be storm drain - orange deposits noted.	
WATER PASSAGES	None observed.	
APRON	Apron totally submerged and not observed.	
VERTICAL AND HORIZONTAL ALIGNMENT	Vertical: Level Horizontal: Straight	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Dam appeared to be outwardly structurally sound. Most surfaces could not be observed due to overflow. Downstream face was generally sound with some deterioration manifest as loose stones.	Recommend inspection with lake drawn down.
STRUCTURAL CRACKING	None observed.	
CONSTRUCTION JOINTS	None observed - stone masonry construction.	
MONOLITH JOINTS	None observed	
LEAKAGE	None observed	
SEEPAGE	None observed	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	Not observed - submerged.	
INTAKE STRUCTURE	Not observed - submerged.	
OUTLET STRUCTURE	Not observed - submerged by tailwater	
OUTLET CHANNEL	Outlet discharges into spillway stilling basin.	
GATE AND GATE HOUSING	Operating mechanism appeared to be in satisfactory condition - not operated at time of inspection. The gate stem was rusted but appeared to be sound. The vertical concrete wall on which the gate is mounted was spalled above the water line.	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
WEIR	Weir was obscured by overflow but appeared to be in generally satisfactory condition.	
DISCHARGE CHANNEL	Spillway discharges into stilling basin formed by stone masonry training walls on the sides and a stone masonry road bridge at the downstream end.	
PIERS	Stone masonry piers appeared to be generally sound with some deterioration noted. Some of the grout appeared to be deteriorated causing displacement of some stones.	
BRIDGE	Concrete slab pedestrian bridge spans the spillway supported by piers and abutments. Concrete surfaces appeared to be in satisfactory condition. Steel pipe railing was in sound condition.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	USGS monument at dam site - not found at time of inspection.	
OBSERVATION WELLS	None observed	
WEIRS	None observed	
PIEZOMETERS	None observed	
OTHER	N.A.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	North shore surrounded by municipal park; remainder in residential area. Shore slopes are generally moderately flat.	
SEDIMENTATION	Soundings in the lake in the vicinity of the dam indicate significant sediment accumulation along the right portion of the dam.	
STRUCTURES ALONG BANKS	Public road bridge crosses lake about 1200 feet upstream from dam. Several dwellings are located along both sides of lake.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Downstream channel consists of nearly straight stream flowing through densely developed area of Hightstown.	
SLOPES	Bank slopes are generally moderately flat.	
STRUCTURES ALONG BANKS	Commercial, industrial and residential buildings are located along channel. Road bridges are located 50 feet and 1000 feet from dam. A pedestrian passage-way connecting two industrial buildings spans the channel about 900 feet from dam.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM		REMARKS
DAM -	PLAN	Plans for reconstruction titled "Dam and Retaining Walls for Memorial Park, Hightstown, N.J." (4 sheets) prepared by E.A. MacMillan, dated 5-29-23, available in NJDEP file.
	SECTIONS	
SPILLWAY -	PLAN	See MacMillan plans above
	SECTIONS	
	DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS		Not available
OUTLETS -	PLAN	Available, MacMillan plans
	DETAILS	Not available
	CONSTRAINTS	Not available
	DISCHARGE RATINGS	Not available
HYDRAULIC/HYDROLOGIC DATA		Not available
RAINFALL/RESERVOIR RECORDS		Not available
CONSTRUCTION HISTORY		Available - correspondence and inspection report in NJDEP file.
LOCATION MAP		Available, MacMillan plans

ITEM	REMARKS
DESIGN REPORTS	Design report prepared by State of New Jersey for reconstruction in 1923.
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS	
HYDROLOGY & HYDRAULICS	Limited hydraulic computations in NJDEP file
DAM STABILITY	Not available
SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS	Not available
BORING RECORDS	
LABORATORY	
FIELD	
POST-CONSTRUCTION SURVEYS OF DAM	Survey of original dam prior to 1923 reconstruction available, MacMillan plans.
BORROW SOURCES	Not available

ITEM	REMARKS
MONITORING SYSTEMS	Not available
MODIFICATIONS	Not available
HIGH POOL RECORDS	Not available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Not available
MAINTENANCE OPERATION RECORDS	One drawdown permit available in NJDEP file. No maintenance records available.

APPENDIX 2

Photographs

PHOTO 1

SPILLWAY

PHOTO 2

WALKWAY OVER SPILLWAY

PEDDIE LAKE DAM
12 NOVEMBER 1979

PHOTO 3

SOUTH DOWNSTREAM TRAINING WALL

PHOTO 4

NORTH DOWNSTREAM TRAINING WALL

PEDDIE LAKE DAM
12 NOVEMBER 1979

PHOTO 5

OUTLET WORKS OPERATING MECHANISM

PHOTO 6

SPALLED CONCRETE AT SOUTH END OF DAM

PEDDIE LAKE DAM
12 NOVEMBER 1979

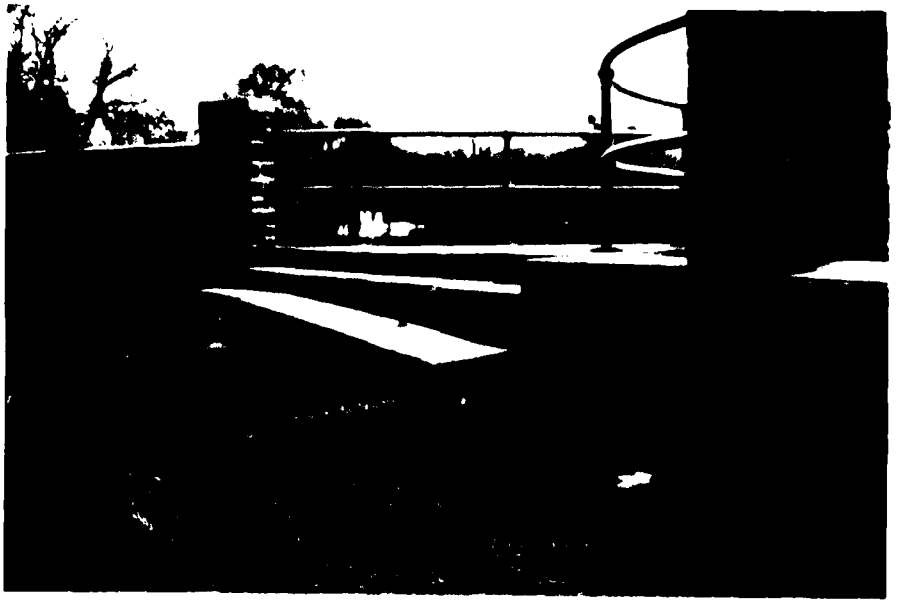


PHOTO 7

SETTLED CONCRETE STEP AT SOUTH END OF DAM

PHOTO 8

SETTLEMENT AT NORTH END OF DAM

PEDDIE LAKE DAM
12 NOVEMBER 1979

PHOTO 9

MASONRY BRIDGE DOWNSTREAM FROM DAM - DOWNSTREAM VIEW

PHOTO 10

DOWNSTREAM CHANNEL

PEDDIE LAKE DAM
12 NOVEMBER 1979

APPENDIX 3

Engineering Data

CHECK LIST

HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Residential and wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 81.5 (63 Ac-Ft)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 88.0

ELEVATION TOP DAM: 84.8

SPILLWAY CREST: Overflow concrete weir

- **a. Elevation** 81(Primary) 81.3 (Secondary)
- **b. Type** Broad crested weir with inclined upstream face
- **c. Width** N.A.
- **d. Length** 21.0 ft. (Primary) 21.0 ft (Secondary)
- **e. Location Spillover** Over crest of spillway (overflow portion of dam)
- **f. Number and Type of Gates** N.A.

OUTLET WORKS: 2'x2' Box culvert or sluice

- **a. Type** Box culvert with lift gate at upstream end
- **b. Location** Left end of dam
- **c. Entrance inverts** 71.0
- **d. Exit inverts** 71.0
- **e. Emergency draindown facilities:** Raise control gate

HYDROMETEOROLOGICAL GAGES: None

- **a. Type** N.A.
- **b. Location** N.A.
- **c. Records** N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake stage equal to top of dam) 860 c.f.s.

APPENDIX 4

Hydraulic/Hydrologic Computations

STORCH ENGINEERS

Sheet 1 of 11

Project PEDDIE LAKE DAM

Made By CLD Date 1/30/80

Chkd By JG Date 2/8/80

HYDROLOGY

HYDROLOGIC ANALYSIS - INFLOW HYDROGRAPH WILL BE DEVELOPED BY THE HEC-1-DS COMPUTER PROGRAM USING THE SNYDER'S METHOD AND ROUTED BY THE MODIFIED PULS METHOD.

SNYDERS COEFFICIENTS

$C_t = 2.0$
$C_p = 0.6$
} SUPPLIED BY ARMY CORP OF ENGINEERS

$t_p = C_t (L L_c)^{0.3}$ where: - "INTRODUCTION TO HYDROLOGY" 2ND EDITION - VEISSMAN

t_p = LAG TIME (HOURS)

C_t = COEFFICIENT REPRESENTING VARIATIONS OF WATERSHED SLOPES AND STORAGES

L = LENGTH OF MAIN CHANNEL FROM OUTLET TO DIVIDE (IN MILES)

L_c = LENGTH OF MAIN CHANNEL FROM OUTLET TO A POINT ON STREAM NEAREST CENTROID OF WATERSHED (IN MILES)

$L = 8.27$ miles $\quad L_c = 4.66$ miles

$t_p = C_t (L L_c)^{0.3} = 2.0 (8.27 \times 4.66)^{0.3}$

$t_p = 6.0$ hours

STORCH ENGINEERS

Sheet 2 of 11

Project PEDDIE LAKE DAM

Made By CLO Date 1/25/80

Chkd By JG Date 2/8/80

DRAINAGE AREA DA

FROM USGS QUADRANGLES : HIGHTSTOWN, ALLENTOWN, JAMESBURG, AND ROOSEVELT

DRAINAGE AREA = 14.2 SQUARE MILES

PRECIPITATION (Ref. "DESIGN OF SMALL DAMS" USDI 1977, FIG. 15)

PROBABLE MAXIMUM PRECIPITATION = 26.2 INCHES FOR 6 hour DURATION & 10 SQ. MI. DRAINAGE AREA.

DURATION (hr.)	% PMP
6	97
12	106
24	114

INFILTRATION DATA

DRAINAGE BASIN MAINLY WOODED

USE: INITIAL INFILTRATION = 1.5 IN.
CONSTANT INFILTRATION = 0.15 IN/HR

STORCH ENGINEERS

Project PEDRIE LAKE DAM

Sheet 3 of 11

Made By CLO Date 1/22/80

Chkd By JG Date 2/8/80

LAKE STORAGE VOLUME

WATER SURFACE ELEVATION	AREA (ACRES)
71.0	0
81.5	18.0
100.0	235.0

HEC-1-DB COMPUTER PROGRAM WILL DEVELOP STORAGE CAPACITY FROM SURFACE AREAS & ELEVATIONS

INFORMATION TAKEN FROM USGS QUADRANGLE MAPS: HIGHTSTOWN & JAMESBURG

HYDRAULICS

THE SPILLWAY AT THE PEDDIE LAKE DAM IS A TWO-STAGE, CONCRETE SPILLWAY. THE PRIMARY CREST IS AT ELEVATION 81.0 WITH A NET LENGTH OF 21.0 FEET. THE SECONDARY CREST IS AT ELEVATION 81.3 WITH A NET LENGTH OF 21.0 FEET. THE EFFECTIVE LENGTH FOR EACH SPILLWAY WILL BE CALCULATED USING THE FOLLOWING FORMULA:

$$L = L' - 2(N K_p + K_a) H_e \quad *$$

DISCHARGE WILL BE CALCULATED USING THE FOLLOWING FORMULAE: $Q = CLH^{3/2}$ WHERE:

- Q = DISCHARGE OVER SPILLWAY
- C = VARIABLE COEFFICIENT OF DISCHARGE
- L = EFFECTIVE LENGTH OF SPILLWAY
- H = TOTAL HEAD ON SPILLWAY

AND $Q = CA\sqrt{2gh}$ WHICH SHALL BE USED TO CALCULATE ORIFICE FLOW WHEN THE DAM CREST IS OVERTOPPED AT ELEVATION 84.8

* "DESIGN OF SMALL DAMS" - U.S. DEPT. OF INTERIOR

HYDRAULICS

THE EFFECTIVE LENGTH OF CREST WILL BE CALCULATED USING THE FOLLOWING FORMULA:

$$L = L' - 2(NK_p + K_a)H_e$$

WHERE:
- L = EFFECTIVE LENGTH OF CREST
- L' = NET LENGTH OF CREST
- N = NUMBER OF PIERS
- K_p = PIER CONTRACTION COEFFICIENT
- K_a = ABUTMENT CONTRACTION COEFFICIENT
- H_e = TOTAL HEAD ON CREST

FOR PRIMARY SPILLWAY:

$L' = 2(10.5) = 21.0$ FEET
$N = 2$
$K_p = 0.02$
$K_a = 0.20$

$\therefore L = 21.0 - 2(2 \times 0.02 + 0.20)H_e$
$L = 21.0 - 0.48\,H_e$

FOR SECONDARY SPILLWAY:

$L' = 2(10.5) = 21.0$
$N = 1$
$K_p = 0.02$
$K_a = 0.20$

$\therefore L = 21.0 - 2(1 \times 0.02 + 0.20)H_e$
$L = 21.0 - 0.44\,H_e$

HYDRAULICS

DISCHARGE VALUES IN THE FOLLOWING TABULATIONS DO NOT INCLUDE THE OVERTOPPING OF 72.3 FEET OF DAM CREST AT ELEVATION 84.8, AS THIS WILL BE COMPUTED BY THE HEC-1-DB COMPUTER PROGRAM BUT DO INCLUDE OVERTOPPING OF 722 FT. OF RETAINING WALLS, LOCATED ON THE NORTH AND SOUTH SIDES OF THE LAKE, AT AN ELEVATION OF 86.0 WITH A WIDTH OF 1.5 FT.

STORCH ENGINEERS Sheet 7 of 11

Project PEDDIE LAKE DAM Made By CLO Date 1/23/80

Chkd By JG Date 2/18/80

STAGE DISCHARGE TABULATION *

WATER ELEVATION	PRIMARY CREST EL. 81.0 L = 21 - 0.48 He					SECONDARY CREST EL. = 81.3 L = 21 - 0.44 He					TOTAL SPILLWAY DISCHARGE
W.S.	He	L	$He^{3/2}$	Q(WEIR)	Q(ORIFICE)	He	L	$He^{3/2}$	Q(WEIR)	Q(ORIFICE)	(CFS)
81.0	0	0	0	0	—	0	0	0	0	—	0
82.0	1.0	20.5	1.0	54.	—	0.7	20.7	0.59	33.	—	87.
83.0	2.0	20.0	2.8	154.	—	1.7	20.3	2.2	121.	—	275.
84.0	3.0	19.6	5.2	298.	—	2.7	19.8	4.4	251.	—	549.
84.8	3.8	19.2	7.4	—	**460.	3.5	19.4	6.6	—	**400.	860.
86.0	5.0	18.6	11.2	—	567.	4.7	18.9	10.2	—	500.	1067.
87.0	6.0	18.1	14.7	—	643.	5.7	18.5	13.6	—	570.	1213.
88.0	7.0	17.6	18.5	—	711.	6.7	18.1	17.3	—	631.	1342.
89.0	8.0	17.1	22.6	—	773.	7.7	17.7	21.4	—	688.	1461.
90.0	9.0	16.7	27.0	—	831.	8.7	17.2	25.7	—	740.	1571.

* VALUES OF "C" OBTAINED FROM TABLE 5-3 "HANDBOOK OF HYDRAULICS" BY KING & BRATER

** SUBMERGED ORIFICE FLOW STARTS AT HEADWATER ELEVATION 84.8 WHERE $Q = CA\sqrt{2gAh}$ $C = 0.60$

Δh (PRIMARY CREST) = He - 1.5' Δh (SECONDARY CREST) = He - 1.35'

A (PRIMARY CREST) = 63 SQ.FT. A (SECONDARY CREST) = 56.7 SQ. FT.

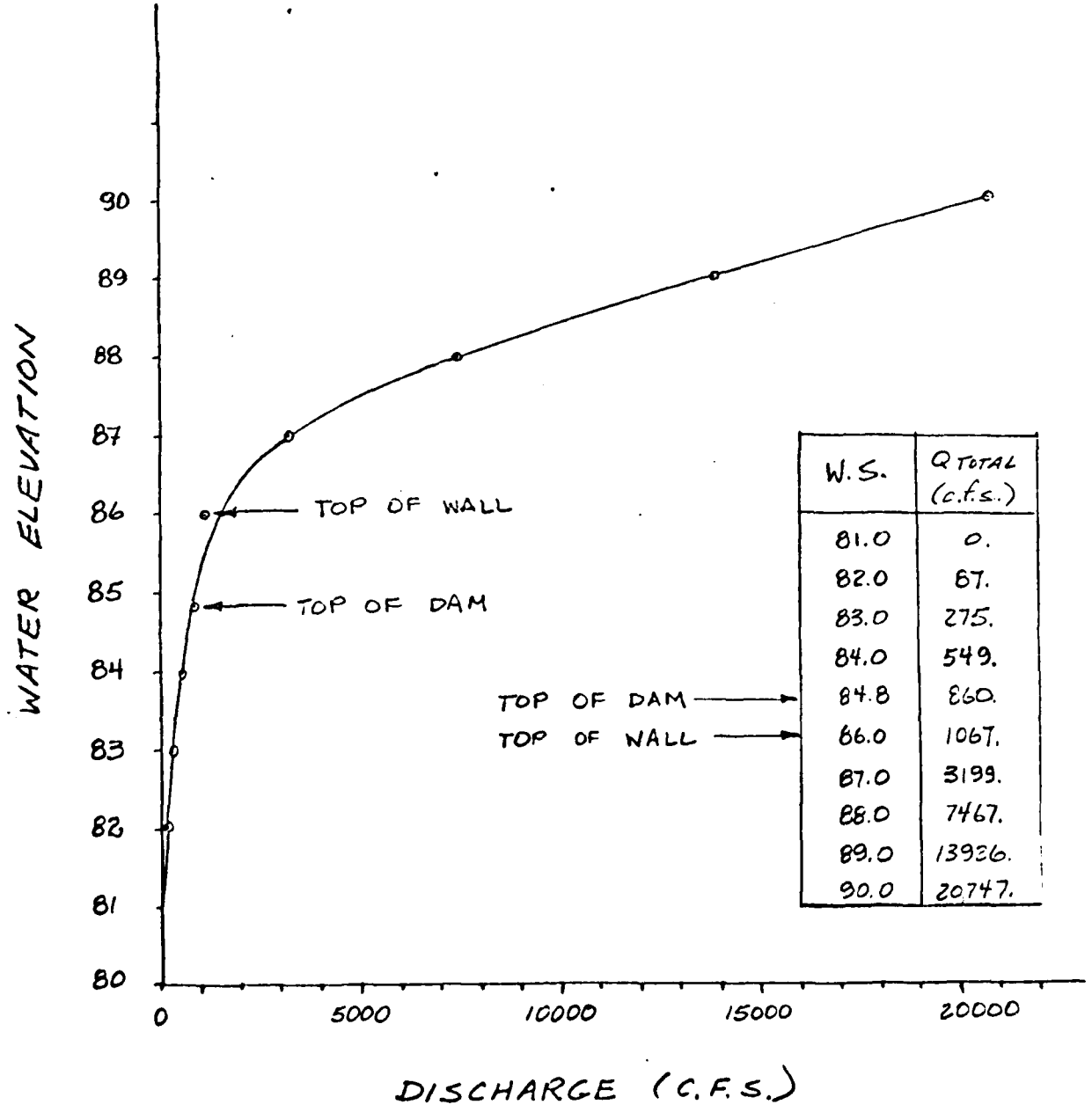
STAGE DISCHARGE TABULATION

FLOW CALCULATED FOR OVERTOPPING OF RETAINING WALLS LOCATED ON NORTH AND SOUTH SIDES OF LAKE CALCULATED UPON TOP OF WALL ELEVATION OF 86.0

WATER ELEVATION	RETAINING WALL CREST EL = 86.0 L = 722 FT.					SPILLWAY DISCHARGE	TOTAL DISCHARGE
H.W.	He	L	$He^{3/2}$	C*	Q	Q (cfs)	Q (cfs)
81.0	—	—	—	—	—	0.	0.
82.0	—	—	—	—	—	87.	87.
83.0	—	—	—	—	—	275.	275.
84.0	—	—	—	—	—	549.	549.
84.8	—	—	—	—	—	860.	860.
86.0	0	0	0	0	—	1067.	1067.
87.0	1.0	722.	1.0	2.75	1986.	1213.	3199.
88.0	2.0	722.	2.8	3.03	6125.	1342.	7467.
89.0	3.0	722.	5.2	3.32	12465.	1461.	13926.
90.0	4.0	722.	8.0	3.32	19176.	1571.	20747.

* VALUES OF 'C' OBTAINED FROM TABLE 5-3, "HANDBOOK OF HYDRAULICS" BY KING & BRATER

STAGE DISCHARGE CURVE



W.S.	Q TOTAL (c.f.s.)
81.0	0.
82.0	67.
83.0	275.
84.0	549.
84.8	860.
86.0	1067.
87.0	3199.
88.0	7467.
89.0	13936.
90.0	20747.

OUTLET WORKS CAPACITY

OUTLET WORKS FOR PEDDIE LAKE DAM CONSISTS OF A 2'x 2' BOX CULVERT WITH A LENETH OF 20' FROM THE N.J.D.E.P FILE OUTLET INVERT IS AT ELEVATION 71.0. INLET INVERT IS ALSO AT 71.0. OUTLET CONTROLS FROM "HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS"

MAXIMUM DISCHARGE. H= 7.5' Q= 60 cfs

AVERAGE DISCHARGE H= 2.25' Q= 32 cfs

DRAWDOWN

AVERAGE DISCHARGE = 32 cfs
AVERAGE INFLOW = 14 cfs based upon 1 cfs/sq.mi.

DRAWDOWN TIME

$$\frac{54 \text{ acre-ft } (43560) \text{ SQ.FT./acre}}{(32-14) \text{ cfs } (3600) \text{ sec./HR.}} = .36 \text{ hours} = 1.5 \text{ DAYS}$$

DRAWDOWN = $\frac{\text{STORAGE AT SPILLWAY CREST}}{\text{AVERAGE DISCHARGE} - \text{INFLOW}}$

STORCH ENGINEERS

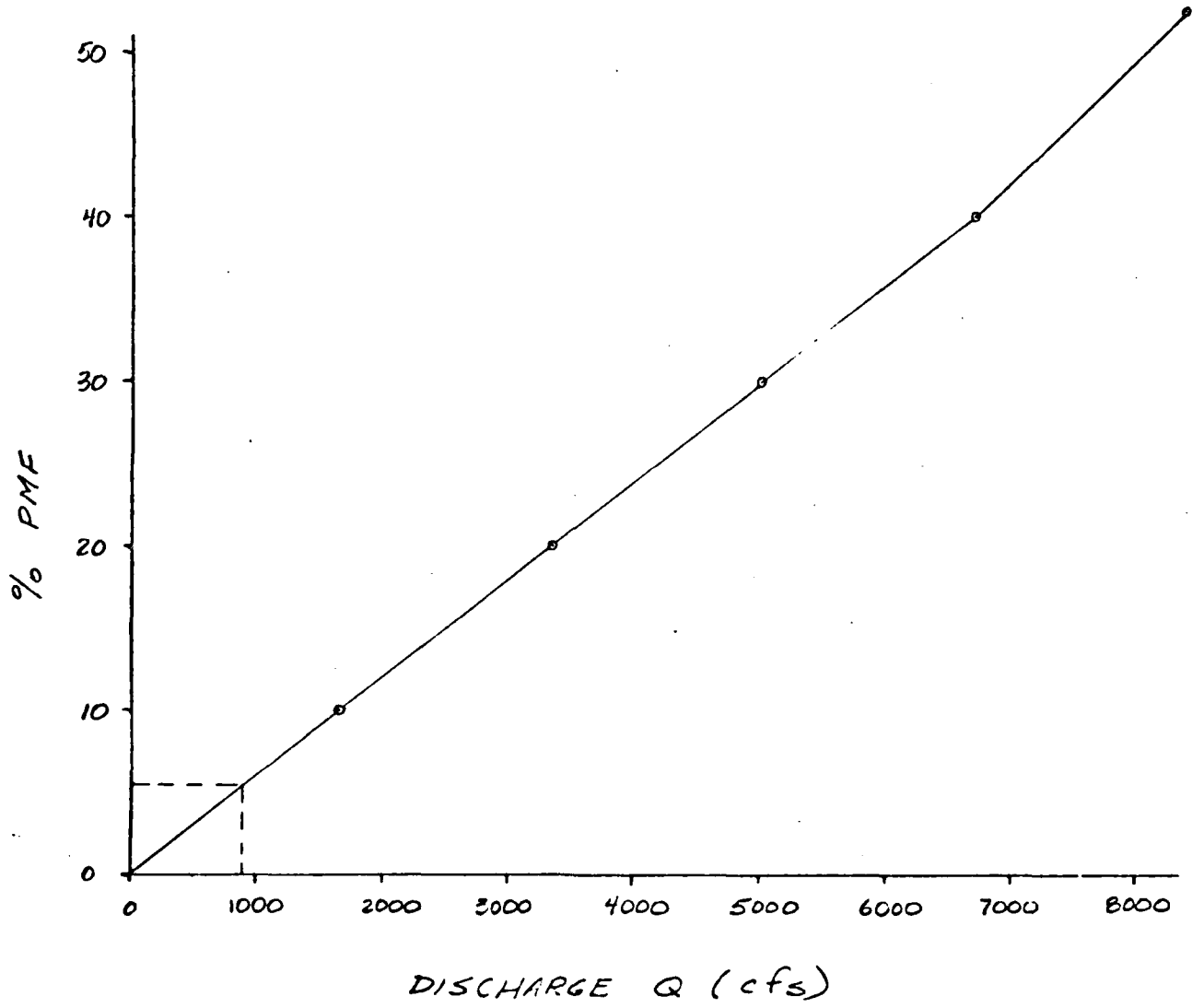
Sheet 11 of 11

Project REDDIE LAKE DAM

Made By CLO Date 1/28/80

Chkd By JG Date 2/8/80

OVERTOPPING POTENTIAL



DAM CAN PASS 6% of PMF
OR 12% of SDF

HEC-1-DB COMPUTATIONS

```
A1       NATIONAL DAM SAFETY PROGRAM
A2       PEDDIE LAKE DAM
A3       MULTI RATIO PMF ROUTING
B     150          1         0                                        0         0         3
B1      5
J       1          5         1
J1    0.5        0.4       0.3       0.2       0.1
K                  0      LAKE                 0         0         1         0
K1       INFLOW HYDROGRAPH TO LAKE
M       1          1      14.2                14.2         0                             1
P       0       26.2        97       106       114
T                                                          1.5      0.15
X     6.0        0.6
X    -1.0      -0.05       2.0
K       1       DAM
K1       ROUTE DISCHARGE THROUGH DAM
Y                                          1         1
Y1      1                                                -81.5        -1
Y4   61.0         82        83        84      84.8        86        87        88        89        90
Y5      0         87       275       545       860      1067      3199      7467     13926     20747
YA      0         18       235
YL     71       81.5       100
YB   81.0
YO   84.8       2.63       1.5      72.3
K      99
A
A
A
A
A
```

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 80/01/30.
     TIME= 12.57.58.


                    NATIONAL DAM SAFETY PROGRAM
                    PEDDIE LAKE DAM
                    MULTI RATIO PMF ROUTING

                                JOB SPECIFICATION
      IO     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
     150       1       0       0       0       0       0       0       3       0
                            JOPER     NWT   LROPT   TRACE
                                5       0       0       0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                            NPLAN= 1 NRTIO= 5 LRTIO= 1
          RTIOS=    .50     .40     .30     .20     .10


**********      **********      **********      **********      **********
                        SUB-AREA RUNOFF COMPUTATION

                    INFLOW HYDROGRAPH TO LAKE

              ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
              LAKE        0       0       0       0       0       1       0       0

                                HYDROGRAPH DATA
     IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
         1       1   14.20    0.00   14.20    0.00   0.000       0       1       0

                                PRECIP DATA
            SPFE     PMS      R6     R12     R24     R48     R72     R96
            0.00   26.20   97.00  106.00  114.00    0.00    0.00    0.00
 TRSPC COMPUTED BY THE PROGRAM IS  .812

                                LOSS DATA
    LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
        0    0.00    0.00    1.00    0.00    0.00    1.00    1.50     .15    0.00    0.00

                            UNIT HYDROGRAPH DATA
                        TP=  6.00    CP= .60    NTA=  0

                                RECESSION DATA
                        STRTQ=   -1.00    QRCSN=    -.05    RTIOR= 2.00
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.77 AND R= 5.82 INTERVALS

          UNIT HYDROGRAPH 35 END-OF-PERIOD ORDINATES, LAG=   5.97 HOURS, CP=  .60  VOL= 1.00
    58.   214.   424.   649.   831.   929.   919.   813.   684.   576.
   485.   408.   343.   289.   243.   205.   172.   145.   122.   103.
    86.    73.    61.    52.    43.    37.    31.    26.    22.    18.
    15.    13.    11.     9.     8.
```

C MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.00	1	.11	0.00	.11	13.
1.01	2.00	2	.11	0.00	.11	12.
1.01	3.00	3	.11	0.00	.11	12.
1.01	4.00	4	.11	0.00	.11	11.
1.01	5.00	5	.11	0.00	.11	10.
1.01	6.00	6	.11	0.00	.11	9.
1.01	7.00	7	.32	0.00	.32	9.
1.01	8.00	8	.32	0.00	.32	8.
1.01	9.00	9	.32	.07	.25	12.
1.01	10.00	10	.32	.17	.15	33.
1.01	11.00	11	.32	.17	.15	84.
1.01	12.00	12	.32	.17	.15	171.
1.01	13.00	13	2.06	1.91	.15	395.
1.01	14.00	14	2.48	2.33	.15	939.
1.01	15.00	15	3.10	2.95	.15	1959.
1.01	16.00	16	7.84	7.69	.15	3821.
1.01	17.00	17	2.89	2.74	.15	6655.
1.01	18.00	18	2.27	2.12	.15	10046.
1.01	19.00	19	.17	.02	.15	13363.
1.01	20.00	20	.17	.02	.15	15835.
1.01	21.00	21	.17	.02	.15	16997.
1.01	22.00	22	.17	.02	.15	16727.
1.01	23.00	23	.17	.02	.15	15266.
1.02	0.00	24	.17	.02	.15	13274.
1.02	1.00	25	0.00	0.00	0.00	11284.
1.02	2.00	26	0.00	0.00	0.00	9522.
1.02	3.00	27	0.00	0.00	0.00	8034.
1.02	4.00	28	0.00	0.00	0.00	6776.
1.02	5.00	29	0.00	0.00	0.00	5712.
1.02	6.00	30	0.00	0.00	0.00	4811.
1.02	7.00	31	0.00	0.00	0.00	4050.
1.02	8.00	32	0.00	0.00	0.00	3409.
1.02	9.00	33	0.00	0.00	0.00	2869.
1.02	10.00	34	0.00	0.00	0.00	2415.
1.02	11.00	35	0.00	0.00	0.00	2033.
1.02	12.00	36	0.00	0.00	0.00	1711.
1.02	13.00	37	0.00	0.00	0.00	1440.
1.02	14.00	38	0.00	0.00	0.00	1212.
1.02	15.00	39	0.00	0.00	0.00	1020.
1.02	16.00	40	0.00	0.00	0.00	859.
1.02	17.00	41	0.00	0.00	0.00	797.
1.02	18.00	42	0.00	0.00	0.00	743.
1.02	19.00	43	0.00	0.00	0.00	694.
1.02	20.00	44	0.00	0.00	0.00	647.
1.02	21.00	45	0.00	0.00	0.00	604.
1.02	22.00	46	0.00	0.00	0.00	563.
1.02	23.00	47	0.00	0.00	0.00	526.
1.03	0.00	48	0.00	0.00	0.00	490.
1.03	1.00	49	0.00	0.00	0.00	458.
1.03	2.00	50	0.00	0.00	0.00	427.
1.03	3.00	51	0.00	0.00	0.00	398.
1.03	4.00	52	0.00	0.00	0.00	372.
1.03	5.00	53	0.00	0.00	0.00	347.
1.03	6.00	54	0.00	0.00	0.00	324.
1.03	7.00	55	0.00	0.00	0.00	302.
1.03	8.00	56	0.00	0.00	0.00	282.
1.03	9.00	57	0.00	0.00	0.00	263.
1.03	10.00	58	0.00	0.00	0.00	245.
1.03	11.00	59	0.00	0.00	0.00	229.
1.03	12.00	60	0.00	0.00	0.00	213.
1.03	13.00	61	0.00	0.00	0.00	199.
1.03	14.00	62	0.00	0.00	0.00	186.
1.03	15.00	63	0.00	0.00	0.00	173.
1.03	16.00	64	0.00	0.00	0.00	162.
1.03	17.00	65	0.00	0.00	0.00	151.
1.03	18.00	66	0.00	0.00	0.00	141.
1.03	19.00	67	0.00	0.00	0.00	131.
1.03	20.00	68	0.00	0.00	0.00	123.
1.03	21.00	69	0.00	0.00	0.00	114.
1.03	22.00	70	0.00	0.00	0.00	107.
1.03	23.00	71	0.00	0.00	0.00	100.
1.04	0.00	72	0.00	0.00	0.00	93.
1.04	1.00	73	0.00	0.00	0.00	87.
1.04	2.00	74	0.00	0.00	0.00	81.
1.04	3.00	75	0.00	0.00	0.00	75.

MO.DA	HR.MN	PERICD	RAIN	EXCS	LOSS	COMP Q
1.04	4.00	76	0.00	0.00	0.00	70.
1.04	5.00	77	0.00	0.00	0.00	66.
1.04	6.00	78	0.00	0.00	0.00	61.
1.04	7.00	79	0.00	0.00	0.00	57.
1.04	8.00	80	0.00	0.00	0.00	53.
1.04	9.00	81	0.00	0.00	0.00	50.
1.04	10.00	82	0.00	0.00	0.00	46.
1.04	11.00	83	0.00	0.00	0.00	43.
1.04	12.00	84	0.00	0.00	0.00	40.
1.04	13.00	85	0.00	0.00	0.00	38.
1.04	14.00	86	0.00	0.00	0.00	35.
1.04	15.00	87	0.00	0.00	0.00	33.
1.04	16.00	88	0.00	0.00	0.00	31.
1.04	17.00	89	0.00	0.00	0.00	29.
1.04	18.00	90	0.00	0.00	0.00	27.
1.04	19.00	91	0.00	0.00	0.00	25.
1.04	20.00	92	0.00	0.00	0.00	23.
1.04	21.00	93	0.00	0.00	0.00	22.
1.04	22.00	94	0.00	0.00	0.00	20.
1.04	23.00	95	0.00	0.00	0.00	19.
1.05	0.00	96	0.00	0.00	0.00	18.
1.05	1.00	97	0.00	0.00	0.00	16.
1.05	2.00	98	0.00	0.00	0.00	15.
1.05	3.00	99	0.00	0.00	0.00	14.
1.05	4.00	100	0.00	0.00	0.00	13.
1.05	5.00	101	0.00	0.00	0.00	12.
1.05	6.00	102	0.00	0.00	0.00	12.
1.05	7.00	103	0.00	0.00	0.00	11.
1.05	8.00	104	0.00	0.00	0.00	10.
1.05	9.00	105	0.00	0.00	0.00	9.
1.05	10.00	106	0.00	0.00	0.00	9.
1.05	11.00	107	0.00	0.00	0.00	8.
1.05	12.00	108	0.00	0.00	0.00	8.
1.05	13.00	109	0.00	0.00	0.00	7.
1.05	14.00	110	0.00	0.00	0.00	7.
1.05	15.00	111	0.00	0.00	0.00	6.
1.05	16.00	112	0.00	0.00	0.00	6.
1.05	17.00	113	0.00	0.00	0.00	5.
1.05	18.00	114	0.00	0.00	0.00	5.
1.05	19.00	115	0.00	0.00	0.00	5.
1.05	20.00	116	0.00	0.00	0.00	4.
1.05	21.00	117	0.00	0.00	0.00	4.
1.05	22.00	118	0.00	0.00	0.00	4.
1.05	23.00	119	0.00	0.00	0.00	4.
1.06	0.00	120	0.00	0.00	0.00	3.
1.06	1.00	121	0.00	0.00	0.00	3.
1.06	2.00	122	0.00	0.00	0.00	3.
1.06	3.00	123	0.00	0.00	0.00	3.
1.06	4.00	124	0.00	0.00	0.00	3.
1.06	5.00	125	0.00	0.00	0.00	2.
1.06	6.00	126	0.00	0.00	0.00	2.
1.06	7.00	127	0.00	0.00	0.00	2.
1.06	8.00	128	0.00	0.00	0.00	2.
1.06	9.00	129	0.00	0.00	0.00	2.
1.06	10.00	130	0.00	0.00	0.00	2.
1.06	11.00	131	0.00	0.00	0.00	2.
1.06	12.00	132	0.00	0.00	0.00	1.
1.06	13.00	133	0.00	0.00	0.00	1.
1.06	14.00	134	0.00	0.00	0.00	1.
1.06	15.00	135	0.00	0.00	0.00	1.
1.06	16.00	136	0.00	0.00	0.00	1.
1.06	17.00	137	0.00	0.00	0.00	1.
1.06	18.00	138	0.00	0.00	0.00	1.
1.06	19.00	139	0.00	0.00	0.00	1.
1.06	20.00	140	0.00	0.00	0.00	1.
1.06	21.00	141	0.00	0.00	0.00	1.
1.06	22.00	142	0.00	0.00	0.00	1.
1.06	23.00	143	0.00	0.00	0.00	1.
1.07	0.00	144	0.00	0.00	0.00	1.
1.07	1.00	145	0.00	0.00	0.00	1.
1.07	2.00	146	0.00	0.00	0.00	1.
1.07	3.00	147	0.00	0.00	0.00	1.
1.07	4.00	148	0.00	0.00	0.00	0.
1.07	5.00	149	0.00	0.00	0.00	0.
1.07	6.00	150	0.00	0.00	0.00	0.
		SUM	24.25	20.44	3.81	194710.
			(616.)	(519.)	(97.)	(5513.57)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	16997.	15071.	7462.	2694.	194705.
CMS	481.	427.	211.	76.	5513.
INCHES		9.87	19.55	21.17	21.26
MM		250.77	496.65	537.83	539.96
AC-FT		7473.	14801.	16022.	16091.
THOUS CU M		9218.	18256.	19770.	19848.

HYDROGRAPH AT STA LAKE FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8499.	7535.	3731.	1347.	97353.
CMS	241.	213.	106.	38.	2757.
INCHES		4.94	9.78	10.59	10.63
MM		125.38	248.32	268.91	269.98
AC-FT		3737.	7400.	8014.	8046.
THOUS CU M		4609.	9128.	9885.	9924.

HYDROGRAPH AT STA LAKE FOR PLAN 1, RTIO 5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1700.	1507.	746.	269.	19471.
CMS	48.	43.	21.	8.	551.
INCHES		.99	1.96	2.12	2.13
MM		25.08	49.66	53.78	54.00
AC-FT		747.	1480.	1603.	1609.
THOUS CU M		922.	1826.	1977.	1985.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE DISCHARGE THROUGH DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-82.	-1

STAGE	81.00	82.00	83.00	84.00	84.80	86.00	87.00	88.00	89.00	90.00
FLOW	0.00	87.00	275.00	549.00	860.00	1067.00	3199.00	7467.00	13926.00	20747.00
SURFACE AREA=	0.	18.	235.							
CAPACITY=	0.	63.	2024.							
ELEVATION=	71.	82.	100.							

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
84.8	2.6	1.5	72.

STATION DAM, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

31.	23.	17.	13.	10.	8.	7.	6.	6.	8.
15.	32.	68.	192.	477.	1016.	2753.	4758.	6430.	7746.
8441.	8427.	7783.	6804.	5793.	4887.	4120.	3529.	2995.	2513.
2116.	1779.	1497.	1292.	1108.	1046.	913.	786.	645.	536.
472.	425.	388.	358.	332.	309.	287.	269.	254.	239.
223.	209.	194.	181.	169.	157.	146.	136.	127.	118.
110.	103.	96.	89.	85.	81.	77.	73.	69.	65.
60.	57.	53.	49.	46.	43.	40.	37.	35.	32.
30.	28.	26.	24.	23.	21.	20.	18.	17.	16.
15.	14.	13.	12.	11.	11.	10.	9.	9.	8.
7.	7.	6.	6.	6.	5.	5.	5.	4.	4.
4.	3.	3.	3.	3.	3.	2.	2.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STORAGE

60.	59.	58.	57.	56.	56.	56.	56.	55.	56.
57.	61.	68.	85.	117.	175.	236.	270.	292.	309.
319.	319.	310.	297.	283.	272.	262.	252.	241.	231.
222.	216.	210.	204.	193.	178.	163.	147.	134.	124.
117.	112.	108.	104.	102.	99.	97.	95.	93.	91.
85.	87.	85.	84.	82.	81.	79.	78.	77.	76.
75.	74.	74.	73.	72.	71.	70.	69.	68.	68.
67.	66.	65.	64.	63.	63.	62.	62.	61.	61.
60.	60.	59.	59.	59.	59.	58.	58.	58.	57.
57.	57.	57.	57.	57.	56.	56.	56.	56.	56.
56.	56.	56.	56.	55.	55.	55.	55.	55.	55.
55.	55.	55.	55.	55.	55.	55.	55.	55.	55.
55.	55.	55.	55.	55.	55.	55.	55.	55.	55.
55.	55.	55.	55.	55.	55.	54.	54.	54.	55.
55.	55.	54.	54.	54.	54.	54.	54.	54.	54.

STAGE

81.4	81.3	81.2	81.1	81.1	81.1	81.1	81.1	81.1	81.1
81.2	81.4	81.8	82.6	83.7	85.3	86.6	87.2	87.6	87.8
88.0	88.0	87.8	87.6	87.4	87.2	87.1	86.9	86.7	86.5
86.3	86.2	86.1	85.9	85.7	85.4	85.0	84.6	84.2	84.0
83.7	83.5	83.4	83.3	83.2	83.1	83.0	83.0	82.9	82.8
82.7	82.6	82.6	82.5	82.4	82.4	82.3	82.3	82.2	82.2
82.1	82.1	82.0	82.0	82.0	81.9	81.9	81.8	81.8	81.7
81.7	81.6	81.6	81.6	81.5	81.5	81.5	81.4	81.4	81.4
81.3	81.3	81.3	81.3	81.3	81.2	81.2	81.2	81.2	81.2
81.2	81.2	81.1	81.1	81.1	81.1	81.1	81.1	81.1	81.1
81.1	81.1	81.1	81.1	81.1	81.1	81.1	81.1	81.0	81.0
81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0
81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0
81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0
81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0

PEAK OUTFLOW IS 8441. AT TIME 21.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8441.	7552.	3716.	1346.	97429.
CMS	239.	214.	105.	38.	2759.
INCHES		4.95	9.74	10.58	10.64
MM		125.66	247.30	268.83	270.19
AC-FT		3745.	7370.	8012.	8052.
THOUS CU M		4619.	9090.	9882.	9932.

SUMMARY OF DAM SAFETY ANALYSIS

.....		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	81.50	81.00	84.80
	STORAGE	63.	54.	154.
	OUTFLOW	44.	0.	860.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	87.98	3.18	319.	8441.	22.00	21.00	0.00
.40	87.62	2.82	296.	6752.	20.00	21.00	0.00
.30	87.27	2.47	274.	5067.	18.00	22.00	0.00
.20	86.82	2.02	249.	3373.	15.00	22.00	0.00
.10	86.15	1.35	214.	1694.	10.00	22.00	0.00

APPENDIX 5

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